Science, Saints, & Sense

BY R. KENNETH WALTER

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SCIENCE, SAINTS, AND SENSE

by

R. KENNETH WALTER

This book will disappoint those who expect to find in it another scientist's attempt to reconcile science with the scriptures. Most books on science and religion seek to reconcile the two fields; Ken Walter, a scientist and an educator, stresses that there are conflicts, and that we should not pretend that they do not exist.

Science, Saints, and Sense approaches the subject of the relationship between faith in the gospel and the uses of science in a new and stimulating way. Its concern is not with a particular theory or set of theories, but an approach to the subjects of science, technology, theology, and religion by a comparison of the rules and objectives involved in each. The uncertain relationship between scientific theory and truth is contrasted with divine counsel; and though the language and approach are designedly objective, the gospel comes out clearly the winner.

Although most of the illustrations used to demonstrate the author's points are from the scientific field, the book is understandable to the layman and will appeal to a wide audience. It will be a valuable text for LDS scientists, philosophers, and students of the gospel, as well as for all members and friends of the Church who are concerned about living the gospel in a technological age.

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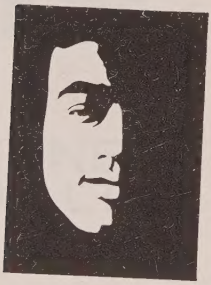
To Charlie in remembrance
of good times.

R. Ken Walter

Science, Saints, & Sense



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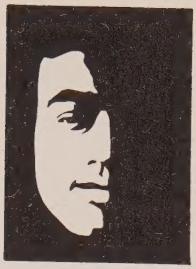

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TO MY PARENTS

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PREFACE

Much has been written to emphasize the harmony between science and religion. Scientists, theologians, and laymen in both fields naturally strive to reconcile their particular ideas of theology with the so-called facts of science. Although this is an admirable and necessary task, it is important to point out that there really are differences. It is time to stop pretending that no conflicts exist. This book examines the relationship between faith in God and the utility of science. It is hoped that the views expressed here will encourage the reader to differentiate between the ways of God and the theories of men.

Few of the ideas contained herein are original; most have been suggested by teachers and friends. However, full responsibility for the content lies solely with the author. Any errors and misconceptions are unintended, and one can only pray that no one will be misled thereby.

Chapter 1

INTRODUCTION

Purpose

This book will disappoint those who expect to find in it another scientist's attempt to reconcile science with the scriptures. One does not solve a conflict by pretending that it does not exist. A concept of the relationship between science and religion will be introduced which, it is hoped, will strengthen the reader's testimony of the gospel of Jesus Christ. Although it is difficult to be fair in a comparison of divine revelation with the theories of man, it is not desired to vilify the latter but only to give a new perspective to the place of science within our lives.

The minds of those whose faith is weak but growing are especially vulnerable to confusion concerning the proper relationship between religious and materialistic philosophies. It could be a sad mistake, for example, to teach a young person in Sunday School that there is no real conflict between theology and scientific investigation. The naive student will be forced to make a choice when he discovers any real disagreement between what he was taught in church and what his science teacher proclaims. He has been correctly taught that there can be no disagreement between truth which is

revealed and truth which is discovered by experience, but he has not been impressed that he will be exposed to many untruths in the name of theology and science. Will it then be any less difficult for him to reject the religion, which has taught him to expect no conflict, than to reject the apparently more reasonable science? The questions which he should begin to ask are: What is truth? Is it important to know complete truth, or is some approximation sufficient? Can I really rely on my senses? Is truth democratic? Do ideas become true because most people believe them? How much of what I am taught is really true?

Before attempting to answer some of these questions it is important to consider the meaning of some of the terms which will repeatedly appear throughout the book.

Theory

There is a large set of words which are used in science to describe the concepts men form to describe the world about them. The first and most honest of these words is *hypothesis*, which signifies a guess or supposition. All science begins with a hypothesis. If after further investigation a hypothesis agrees well with experience and is confirmed by other investigations, it is elevated to the status of theory. Note that in the scheme of things a theory is only an extended supposition and should not be considered as more than this. There exists much misunderstanding among those who should be most familiar with these terms concerning their use, and often *scientific theory* is thrown about as if the term implied ultimate truth. When a theory of science has been found to hold without exception by all those of the scientific community who wish to test it, it becomes a law. That is, the concept is now a statement of experience considered to be invariable under unchanging conditions. Finally, when the law is felt to be basic and to encompass all other laws of the same nature, it receives the maximum respect which the scientist can give and acquires the designation *principle*, an idea which is assumed to be of universal application.

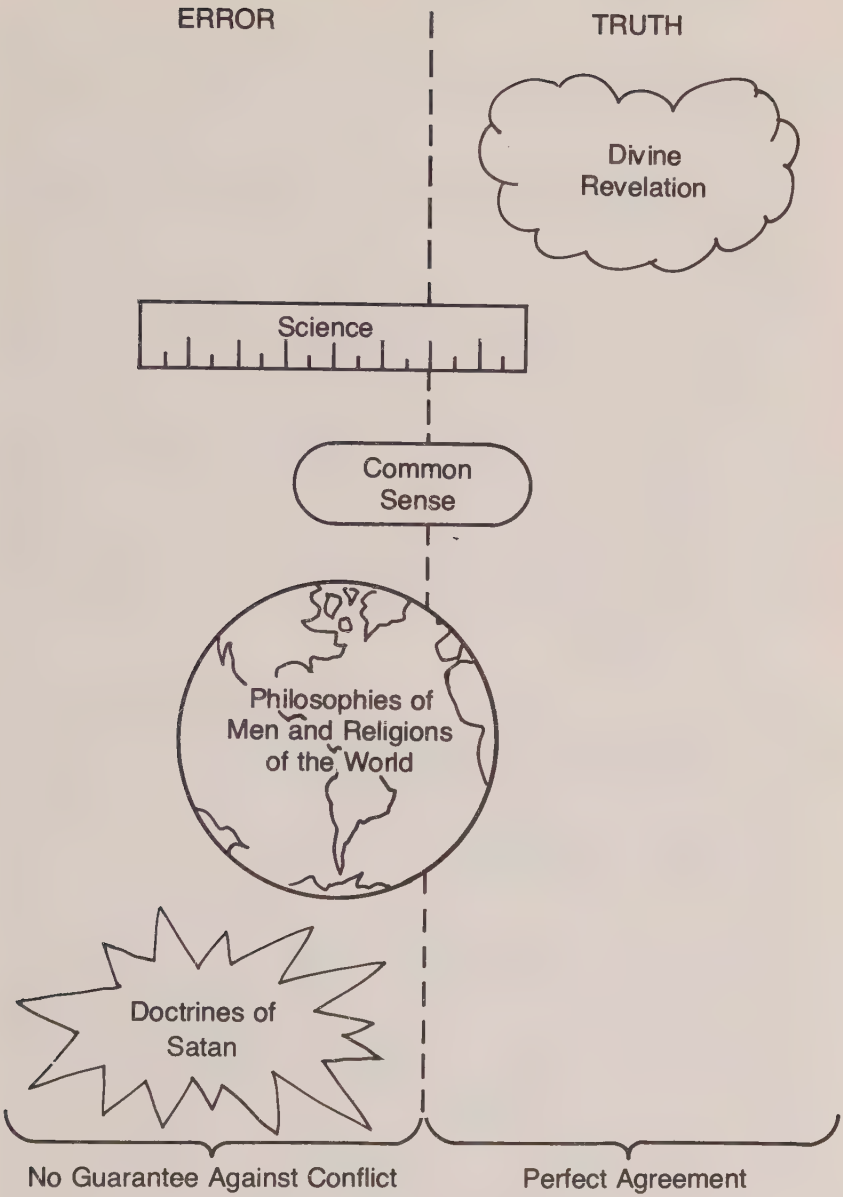

Figure 1

The Relationship of Commonly Encountered Ideas to Truth and Error

To illustrate, consider the following concepts from classical mechanics:

1) The sun, planets, moon, and stars exhibit the same type of attraction and move in the same manner as objects under similar conditions at the surface of the earth.

2) The gravitational attraction of two bodies is proportional directly to the product of their masses and inversely to the square of the distance separating them.

3) (a) "Every body perseveres in its state of rest, or of uniform motion in a right line, unless it is compelled to change that state by forces impressed thereon."

(b) "The alteration of motion is ever proportional to the motive force impressed; and is made in the direction of the right line in which that force is impressed."

(c) "To every action there is always opposed an equal reaction: or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts."[1]

4) All processes occur so that the product of energy and time is a minimum.

The first of the four concepts is called a *hypothesis*. It is a supposition which Isaac Newton made in the development of his famous laws. The second concept is the classical *theory* of gravitation; the third set of ideas are Newton's *laws* of motion; and the fourth statement is the *principle* of least action. From the principle of least action the laws of motion can be derived, and the laws of motion in turn lead to the theory of gravitation.

There is no guarantee that a law or even a principle will not be replaced eventually by a more comprehensive law or principle. Newton's laws of motion have in fact been

[1]Isaac Newton, *The Mathematical Principles of Natural Philosophy* (New York: The Citadel Press, 1964), p. 23.

found to be insufficient to predict the motions of bodies traveling at very high speeds and are replaced in that case by Einstein's relativity theory. However, Newton does not thereby become useless; his laws, which are more easily applied, still approximate experience well enough to be valuable in most circumstances. *Hypothesis*, *theory*, *law*, and *principle* are all used interchangeably. Properly they indicate varying degrees of comprehensiveness; however, none of these words refer to a concept which is absolutely assured to be correct and infallible. Often a concept is called *theory* in the textbook and *law* in the classroom. Herein the word *theory* will be used unless, as in the principle of least action, another description has found universal usage. Hence *theory* will indicate any concept of science or any philosophy of men which is based upon an initial supposition or guess and which is always susceptible to replacement by a more satisfactory concept.

Truth and Reality

The words *ultimate truth* were used in the last section to describe what a scientific theory is not. There it was hoped that the reader would have enough feeling for *truth* that the idea would be clear. However, if the concepts *real*, *reality*, and *truth* are to be used meaningfully, they must be more carefully defined.

Read carefully what the Lord told the Prophet Joseph Smith about the meaning of truth: "For the word of the Lord is truth, and whatsoever is truth is light, and whatsoever is light is Spirit, even the Spirit of Jesus Christ."[2] Also:

> Ye were also in the beginning with the Father; that which is Spirit, even the Spirit of truth;
>
> And truth is knowledge of things as they are, and as they were, and as they are to come;
>
> And whatsoever is more or less than this is the spirit of that wicked one who was a liar from the beginning.

[2]Doctrine and Covenants (hereafter shown as D&C) 84:45.

> The Spirit of truth is God. I am the Spirit of truth, and John bore record of me, saying: He received a fulness of truth, yea, even of all truth;
>
> And no man receiveth a fulness unless he keepeth his commandments.
>
> He that keepeth his commandments receiveth truth and light, until he is glorified in truth and knoweth all things.
>
> Man was also in the beginning with God. Intelligence, or the light of truth, was not created or made, neither indeed can be.
>
> All truth is independent in that sphere in which God has placed it, to act for itself, as all intelligence also; otherwise there is no existence.[3]

If only these concepts were fully understood, there would be no purpose for this book. What a comfort it is in the midst of a sea of despair to know that truth really exists, and that there are beings who comprehend it! Truth is the word of the Lord and *knowledge* of things. Intelligence was not created or made and is independent; "otherwise there is no existence." The key word is *knowledge*. In contrast to theory, which is based upon guess and supposition, truth is knowledge. When man possesses the truth he knows, he is certain, and he does not need to rely upon his efforts to guess. God did not create truth or the ability to comprehend it. Truth is coeternal with God. Unless God is and truth is and man is, nothing is. How many philosophers have spent their lives asking the question, "Is there existence outside of my own mind?" and have never found the answer! The answer is certain. Yes, truth exists. What blessings are derived from heeding the words of the prophets! Even the least among the faithful are wiser than the greatest philosophers who have had only themselves on whom to rely. Thus truth is the knowledge of things as they eternally exist.

The reader has probably already seen that, although it is in the realm of possibility for a theory to contain truth, no one can be certain of the truth of any concept unless it has been revealed by him who knows all things. How important is truth? Often in science it is simpler and more

[3]D&C 93:23-30.

convenient to use a theory, such as Newton's, even though it is known that it only approximates experience and that a more exact theory, relativity, exists. The scientist is satisfied with being able to measure things to a given accuracy only. He does not expect to know and often does not even care about ultimate truth. However, the Saints cannot be satisfied with only an approximation to the truth in spiritual matters. It is, for example, only approximately true that a man must be baptized to enter the kingdom of God. The complete truth is that a man must be baptized by "water and of the Spirit,"[4] by immersion and by one holding the priesthood authority[5] to enter into the kingdom. An approximation to truth, baptism by any other means or by one who has not received the authority is not recognized, and even if one is uncertain it must be performed again in the proper manner.

> And it came to pass, that . . . Paul having passed through the upper coasts came to Ephesus: and finding certain disciples,
>
> He said unto them, Have ye received the Holy Ghost since ye believed? And they said unto him, We have not so much as heard whether there be any Holy Ghost.
>
> And he said unto them, Unto what then were ye baptized?
>
> And they said, Unto John's baptism.
>
> Then said Paul, John verily baptized with the baptism of repentance, saying unto the people, that they should believe on him which should come after him, that is, on Christ Jesus.
>
> When they heard this, they were baptized in the name of the Lord Jesus.
>
> And when Paul had laid his hands upon them, the Holy Ghost came on them; and they spake with tongues, and prophesied.[6]

Hence, in this instance and in all cases where eternity is concerned, the complete truth is important. One must strive to know the truth, not to be satisfied with partial truths.

Reality and *real* refer to things as they actually are. The real world is that which exists outside the mind of man.

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[4]John 3:5.
[5]D&C 13.
[6]Acts 19:1-6.

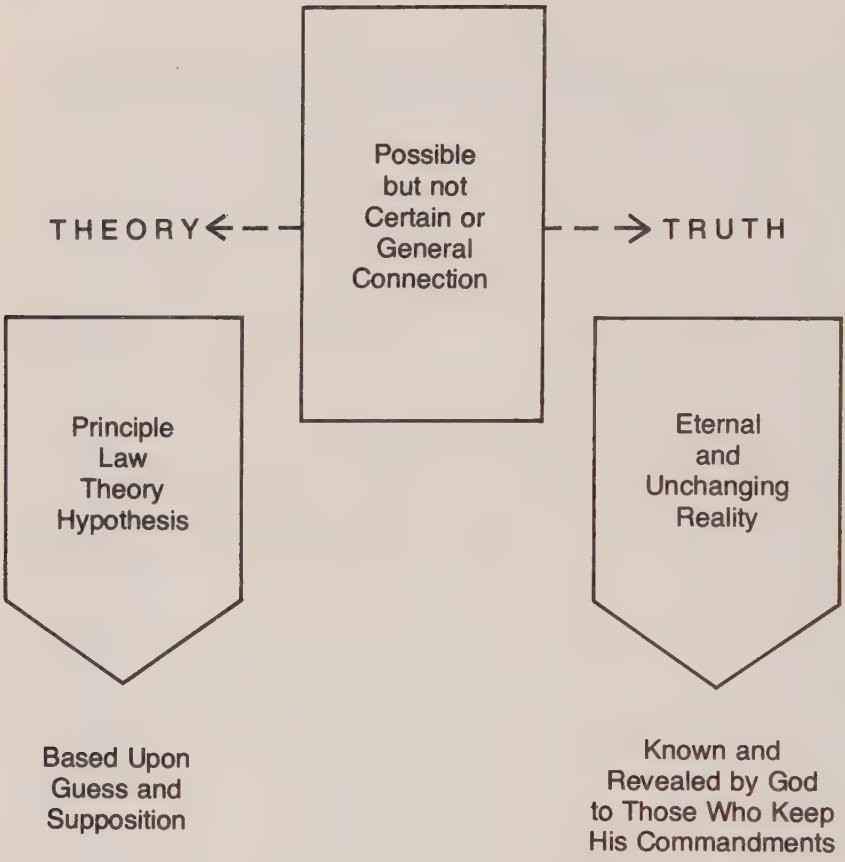

Figure 2

The Relationship Between Theory and Truth

Without the revealed gospel and the plan of salvation there is no assurance that anything exists at all; but God is the God of light; he does not deceive man into believing in a nonexistent universe; otherwise he would be a God of deceit, would cease to be God, and would become like unto Satan himself. However, it is advisable to question what one thinks he knows about the world in which he lives. The fact that man is not deceived by God does not imply that what he believes about reality is true. When every man holds only true concepts, the confusion and conflicts which exist between men in the world must necessarily cease. The "sane" person's concepts of the real world need only be similar to those of his fellow man but not more than a rough representation of things as they really are in order for him to be able to act with a minimum of inconvenience. It is probable that all men will be greatly surprised when the veil is lifted from their minds and their understanding is opened so that they can comprehend things as they really exist.

Nature

The word *Nature* (capitalized) will mean those immediate experiences which result from the external real world. Assume for the sake of argument that electrons and protons were the only elementary particles which really existed. Then the ability to synthesize all known elements from these two entities alone would be a fact of Nature, i.e., part of man's immediate experience. However, even the least well-read modern physicist knows that the elements cannot be built from only protons and electrons, because this idea does not agree with other experiences which scientists have had. Neutrons at least and probably many others of the dozens of so-called elementary particles discovered since 1932 are also required to build an atomic nucleus which even resembles Nature or experience. The building of atoms from two particles alone does not correspond to Nature, though in the early part of the twentieth century most were certain it did. Nature is not expected to change (except perhaps in extreme cases such as the earth's fall from and renewal to a state of per-

fection and glory). Surely God did not suddenly plant neutrons in every atom in 1932. Man had become capable of more experience, and his old concepts of Nature needed revision.

Broader experiences generally require different interpretations. How the real world is experienced will be discussed in another chapter, but the important thing to remember is that Nature exists. The experiences are waiting for men, although it is impossible in one lifetime to experience everything, and it is presumptuous to claim knowledge of things (truth) solely on the basis of the short contact which this life affords with Nature.

The scientist tries hard to experience more. He is constantly striving to understand more of Nature's secrets; thus he is perhaps justified in claiming the ability to build concepts of Nature which are closer to truth than the layman in his field. Much the same is the shoemaker who can repair a shoe better than those who have not developed his skill. Nevertheless, most shoemakers undoubtedly get much closer to discovering the nature of shoes, their own creations, than scientists do to understanding the creations of God.

Science and Technology

Science is derived from the Latin *scientia* or *scire*, to learn or to know. Thus technically the word refers to all learning and knowledge. However, the most common use of *science* (which will be used here) scarcely encompasses all learning. Rather it means the process of gathering and attempting to fit into some kind of order experiences from the external world, i.e., an attempt to describe Nature.

Now it may be objected, for example, that the pure mathematician appears not to be searching for anything which has the remotest connection with reality. Some mathematicians even claim failure if their ideas are found to have any practical use. But mathematics is a creation of man, an art, rather than an attempt to discover and order the real world. Hence mathematics is not properly called a science.

Since the most familiar and commonly used mathematics seems to be based principally upon the fact that man has ten fingers, rather than seven or thirteen for example, it is not only surprising that the scientist finds this invention so useful but somewhat astonishing that it can be applied at all.

While the scientist derives as much order as he can from a given set of experiences, the engineer tries to apply what the scientist has learned. The application of science to change the world is called technology. Building bridges based upon the principles of mechanics, making bombs or nuclear reactors using the theories of radioactivity, constructing televisions and stereo phonographs on the basis of electric theory; these are some of the applications of science called technology. Thus science is the study of Nature, and technology is the application of the results of this study.

Theology and Religion

Dr. James E. Talmage explained that theology is the study of God and his creations.[7] Since all things in man's experience are either directly or indirectly the creations of God, theology must encompass the study of everything real. In this sense science could also be considered a study of theology; but since the methods of scientific study are considerably different from the methods of study of the things of God (as will be discussed later), theology and science should and will be treated as separate entities. If license is allowed to define *Science* (capitalized) as that study of Nature which considers the infinite and relies on revelations, as opposed to *science* which considers only the material world and relies on man's own abilities, then Science, but not science, could be properly classed as theology.

A distinction must also be made between divinely revealed or inspired theology and the philosophies or theologies of men; the former is truth while the latter must necessarily remain in question just as the theories of science. Herein

[7]James E. Talmage, *The Articles of Faith* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints), chapter 1.

theology will refer to the study of God and his works based upon the principles which have been revealed through the prophets. Hence theology is embraced in the concept *truth.* When the philosophies of men, which are sometimes called theologies, are referred to, the appropriate modifiers will be used to make it clear that divine truth is not necessarily being discussed.

Much the same as technology is the application of science, religion is the application of theology. In this case the application is certainly as important as the study. A scholar can be a great theologian and have studied God and his creations more extensively than any other man on earth; but unless he applies the theology, unless he lives his religion, his studies will be of little use to him. Man does not return to the presence of God only because he knows of the ways of God, but also because of what he does with this knowledge. The prophets will not experience eternal progression in the presence of God because they saw Christ sitting on the right hand of God and bore witness that he lives.[8] That knowledge, that certainty, would avail them nothing if they did not try to apply it and to live worthy of inheriting that eternal glory. Similarly, science would appear to be of little value unless applied. Of course man can exist with a minimum of technology. Man can exist with a minimum of religion, but it is a bleak goal only to hope for a bare existence throughout eternity. Eternal life (progression, glory, the companionship of God, eternal increase) should be the goal of every man; and these come only through living the gospel, only through religion. Without technology, of what use is science? Without religion, of what value is theology?

Common Sense

Some of the hardest words to define are those which are used most often. Such a concept is *common sense.* Common sense is usually associated with good judgment, but it is more than that. It is the ability inherent in every man to

[8]D&C 76:20-23.

build ideas from the experiences of his senses. Some people are perhaps more "common" than others in this respect since they seem to come up with brilliant concepts and to relate very easily to those about them, while others cannot seem to learn and retain the most rudimentary habits. However, most people have a certain capability for discovering and remembering those things which make it easier for them to live in the world. It is often said that common sense follows science; i.e., that scientists make a discovery contrary to those ideas with which men have been comfortable in the past; and then the common man will eventually come to believe and make a part of himself those strange, new concepts which the scientist has found. However, even the most theoretically oriented scientist possesses a certain amount of common sense. It would be extremely difficult for any man to develop a completely new idea independent of his own desire to relate to the world about him. He must have a foundation upon which to build. It may be possible that science would progress more rapidly towards discovering truth if science followed common sense rather than vice versa.

Playing the Game

How then are science, theology, and common sense related in the search for truth? In every game, such as the pursuit of science, there must be a starting point, a goal, and a set of rules. Accordingly the next few chapters consider the questions: Why search for truth? What is the situation which prompts investigation? Are there differences between the objectives of science and those of theology? What are the rules to be followed in the pursuit of knowledge? Finally, specific concepts and limitations of science, common sense, theologies of men, and other philosophies will be treated; and some conclusions are drawn about the relationships among Science, Saints, and Sense.

Chapter 2

SITUATION: WHY INVESTIGATE?

The Beginning

Now the serpent was more subtil than any beast of the field which the Lord God had made. And he said unto the woman, Yea, hath God said, Ye shall not eat of every tree of the garden?

And the woman said unto the serpent . . .

. . . of the fruit of the tree which is in the midst of the garden, God hath said, Ye shall not eat of it, neither shall ye touch it, lest ye die.

And the serpent said unto the woman, Ye shall not surely die:

For God doth know that in the day ye eat thereof, then your eyes shall be opened, and ye shall be as gods, knowing good and evil.

And . . . the woman . . . did eat, and gave also unto her husband with her; and he did eat.

And the eyes of both of them were opened. . . .

And the Lord God said, Behold, the man is become as one of us, to know good and evil: and now, lest he put forth his hand, and take also of the tree of life, and eat, and live for ever:

Therefore the Lord God sent him forth from the garden of Eden, to till the ground from whence he was taken.

So he drove out the man. . . .[1]

---

[1]Genesis 3.

Men like to blame others for their problems. "If Adam and Eve had not eaten the forbidden fruit," they reason, "we would still be living in bliss under the parental hand of God in the garden of Eden." However, the Book of Mormon prophet Lehi makes it clear that had Adam not fallen there would have been no children, and Adam would have remained in a state of innocence forever.[2] The Latter-day Saints know, as did the prophets of old, that Adam chose to disobey the commandment not to partake of the forbidden fruit in order to fulfill the higher law to multiply and replenish the earth. Adam deserves our respect for the personal sacrifice he made in order that men might be and that they might know good from evil.

Since the early 1860s when Dr. Darwin's *The Origin of Species* was gaining popularity, the world has come to apply the concept of things evolving from simple to complex in nearly all its patterns of thought. It is not the purpose at this point to discuss the theories of evolution, though the problem of death before Adam squarely confronts those who would claim no conflict between science and religion. There are good arguments for and against the theories, though their relative numbers remind one of the ratio of good anti- to pro-Mormon literature during the late nineteenth century.[3] It is important here only to realize that this controversy still rages and has by no means been resolved. It has nevertheless become more and more popular to discount the Adam story completely or in part and to claim that modern man developed from an earlier primitive state.

Whether one accepts the gospel of Jesus Christ or not, it should be apparent that every living person on the earth must be the descendant of a first man or of a group of first men. The scriptures teach that God created the first man in

---

[2]2 Nephi 2:22-25.

[3]Pro-evolution arguments are readily available in most science texts. For a discussion of the theories from a different point of view, consider M. A. Cook and M. G. Cook, *Science and Mormonism* (Salt Lake City: Deseret News Press, 1967) or Henry M. Morris, *The Twilight of Evolution* (Grand Rapids, Michigan: Baker Book House, 1964).

his own image and after his own likeness.[4] It would be an error to claim that Adam was only a primitive life form because God, in whose image he was created, was or is also of that form. Is it not more likely that modern man is not superior to Adam's perfect state at all but that men in general have fallen to the state in which they now find themselves?

According to his own desires, every man is allowed to come to earth after having kept his first estate in the preexistence, to gain a body and to prove his worthiness or unworthiness to reenter the presence of God, his Father. Father in heaven must know his children well enough that he could assign each one to his respective degree of glory; but it is important for each one to gain the experience and to prove to himself just how valiant he really is. God gives every possible assistance without destroying that free agency which is so necessary for progression. He allowed Jesus Christ, his only Son in the flesh, to come to earth at his own request to live a perfect life and then suffer for the sins of his spiritual brothers and sisters so that each soul who repents and endures can be spared the agony of that suffering. Every man born has already shown some degree of faithfulness in the presence of the Father during the preexistence. Now he must prove his worthiness while away from God's immediate presence. So that man might not experience direct contact with the spiritual realm, a veil has been drawn across the mind.

Here then is the situation. Man's real eyes of understanding are blind; he must learn by earthly experience and show himself worthy of exaltation even without direct spiritual knowledge. The veil can be broken; man can receive revelation and learn truth, have certainty, if he will obey the commandments which a wise Father has given for the benefit of his children. However if man prefers to ignore the wisdom of God and rely on his own abilities, he is left free to grope in darkness, perhaps discovering a truth now and again but never certain of the difference between truth and theory.

---

[4]Genesis 1:27 and Moses 2:26.

Why Am I Here?

Man has a desperate desire to penetrate the veil or at least to discover what the purpose of life is. Does this world, does this life, have meaning; or is existence absurd, without plan, useless? Is there a reality, or are we products of our own or someone else's imagination? Why does tomorrow seem to hold such charm and promise when tomorrow only brings one nearer to an unknown destiny? These are real problems for those who live without revelation and hope. Try to imagine for an instant what despair can well up in the mind of that person who ultimately has only death, non-being and uncertainty to which to look forward; and contrast that despair with the joy of knowing for sure that every man can continue to live and love and progress forever.

There are then at least two contrasting ways of searching for meaning and purpose in life. One can rely on himself and his sciences for an answer, or he can test the promises of the prophets: "If any of you lack wisdom, let him ask of God, that giveth to all men liberally, and upbraideth not; and it shall be given him. But let him ask in faith, nothing wavering. For he that wavereth is like a wave of the sea driven with the wind and tossed."[5] How much are we guilty of wavering, running from one popular theory to another and being caught up in the whirlwind of confusion rather than asking of God in faith?

Let us examine some situations in which men have found themselves and the means by which they have attempted to answer the question, Why are we here?

The Priest-Scientist

Even the most primitive people have some sense of science. Consider, for example, the native who has observed that the sun and the moon apparently go around the earth day after day. He must at least feel, perhaps without being consciously aware, that Nature exhibits some regularity. In

[5]James 1:5-6.

fact, the more attention he pays to Nature's regularity, the less difficult his life becomes. He is soon aware that there are certain periods when it is easiest to stalk his prey, that he regularly requires something to eat, that he periodically needs sleep. If he becomes only slightly more abstract in his thinking, he surmises that the earth has an edge or an extent since the sun appears to go all the way around. It should not be too difficult for the more brilliant savage to induce that the sun nightly casts a round shadow of the earth on the moon; hence the earth must be round, possibly disc-shaped. However when one reads accounts from the earliest records of science, he never ceases to be amazed and to wonder why he himself had not drawn the obvious conclusions from such observations. It does not become any man to be smug about the modern world in which he lives and about how much smarter he must be than the ancients.

In a primitive society the person who learns to chart the heavens and to predict special events, such as eclipses of the sun and moon and appearances of the planets in various corners of the sky, soon becomes a priest because he knows of heavenly things. In this respect the primitive man and the modern man have a common basic problem, worship of science and the scientist. When religion is in the hands of the scientist just as when it is in the hands of the theologian, the philosopher, or the temporal ruler, dogmatism often reigns. Consider as an illustration the millenia between the time the world had forgotten the truths which the Lord taught to Abraham about the earth and its relationship to other heavenly bodies[6] and the period when men again began to realize that the earth is not necessarily the center of the universe. How many adventurers missed discovering America because of fear of falling over the edge of the disclike earth! How many brave men have been threatened with death because they proposed more useful theories than those of the priest-scientist leaders! Yet contrast this with the comparative ease and faith with which Nephi in the Book of Mormon

[6]Abraham 3 and 4.

built a ship and sailed halfway around the world under the Lord's guidance long after most men had forgotten and before they had discovered for themselves that the earth had another half.

It may be argued that modern western man knows enough not to worship the scientist and his theories. Consider, however, the following excerpt from a recent editorial in a news magazine for physicists by one of the world's best-known astronomers:

> Why in fact do we do physics? . . . The real motive, of course, is a religious one. If this statement comes as a surprise to you, the reason is that nowadays our idea of religions has become cheapened by meaningless repetition of concepts we know to be wrong. But in their day these concepts represented a view of the world that is the counterpart of modern physics. . . .
>
> It seems to me that our only chance for the future is to recognize ourselves for what we are—the priests of a not very popular religion—and to see what we can do about it. If society will not accept us for what we are, we must change society.[7]

One cannot blame Dr. Hoyle for believing that religion is a "meaningless repetition of concepts we know to be wrong." Certainly most man-made theologies are just that. However the religion of which he styles himself a priest is probably more popular than he thinks. In a society in which a large part of the population is more interested in the luxuries and ease which improved technology can bring than they are in obeying the Ten Commandments, one cannot help but wonder how much more the materialistic philosophy must be worshipped for it to be considered popular and what the consequences of such worship would be. Perhaps this is being a bit too harsh on Dr. Hoyle. He probably would not consider the worship of material goods and technological change the same as his scientific religion; though it is difficult to see the difference, since the sciences (but not scientists in general, thank goodness) are concerned with the material world and reject the spiritual completely.

[7]Fred Hoyle, *Physics Today*, Vol. 21, No. 4 (April 1968), pp. 148-149.

Experience Versus Reason

Strange concepts have developed in different periods when men have found themselves cut off from divine guidance and at the same time possessing a desire to understand the world about them and the meaning of life. It is said that the ancient reckoners assigned a religious significance to numbers. The art of calculating with whole digits was believed to be a gift of the gods. When fractions were discovered they were considered wicked, and some reckoners were undoubtedly driven to suicide when it was found necessary to use irrational numbers such as π or $\sqrt{2}$ which cannot be expressed as the ratio of two whole integers. For centuries one of the top priority tasks of mathematicians was the forever unsuccessful attempt to express the ratio of the circumference to diameter of a circle as some combination of rational numbers. Even in recent times at least one well-meaning politician has attempted to pass a law requiring that this ratio be set to exactly 3.

The ancient Greek philosophers realized the futility of trying to determine truth by experience alone. Many of them began to wonder whether reason could provide the answers to their questions about the world around them, and logic was for some time the accepted means of scientific inquiry. The natural philosopher (as scientists were called) at the time of Aristotle was engaged in metaphysics and had little use for experimental research. It is said that one man, tired of arguing the question, suggested looking in the horse's mouth to determine the number of teeth the horse has; he was nearly executed on the spot by his associates. Archimedes and a few of his contemporaries took strides in technology however. The weapons they designed were said to be unique and quite effective; and the story of his running from the bath crying "Eureka, Eureka" when he discovered the laws of buoyancy is well known. But although Archimedes would be considered an experimental or applied physicist today and though his discoveries were useful, they could hardly have given the assuring answers which the philosophers

were seeking. Reason and logical argument became the rule of the day; and that day lasted until about the sixteenth century when Galileo and those that followed him realized that the combination of investigation and reason, though not sufficient, is more likely to lead to useful concepts of Nature than argument alone.

It seems ridiculous to think that anyone could believe that reason without experience could lead to theories approximating the truth. But is the attitude of some modern scientists so much different who maintain that progress in the natural sciences in the future will probably be made by deriving aesthetically beautiful equations and mathematical formalisms and then making the experimental facts fit them? Dr. Erwin Schroedinger, who developed the wave equation for modern quantum theory, expressed in the following words some concern that the connection between observation and theory is somewhat tenuous:

> So the facts of observation are irreconcilable with a continuous description in space and time—What is to be done? The method adopted at present may seem amazing to you. It amounts to this: we do give a complete description, continuous in space and time without leaving any gaps, conforming to the classical ideal—a description of something. But we do not claim that we thus describe what nature (matter, radiation, etc.) really is. In fact we use this picture (the so-called wave picture) in full knowledge that it is neither.[8]

Here in quantum mechanics is a case where it was deemed necessary to resort to the logic of mathematics first and then essentially to make experience fit the logic. It appears that this fit of experience to logic is somewhat forced, as will be seen as the uncertainty principle and other results of the quantum theory are discussed later in this book. Let it suffice here to point out that Max Planck, whose black-body radiation equation was the beginning of quantum mechanics,

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[8]E. Schroedinger, "Science and Humanism," *Physics in Our Time* (Cambridge, 1961), quoted in J. R. Newman, *The World of Mathematics* (New York: Simon and Schuster, 1956), 2:1056-1068.

and Albert Einstein, who won the Nobel prize in physics in 1921 for a quantum explanation of the photoelectric effect, both remained convinced that the interpretations which their colleagues placed on the results of their investigations were in error.

When Will Science Have Discovered Everything?

It was thought by many at the end of the nineteenth century that scientists had discovered most of the basic natural laws and that only a few problems remained, such as explaining the black-body radiation spectrum, specific heats of metals, etc. Pierre Simon de Laplace, a nineteenth-century French mathematician and astronomer, maintained already in 1814 that a sufficiently intelligent being knowing the state of every atom in the universe at a given instant could predict with certainty from the laws of mechanics then known all events—past, present, and future.[9] Even as late as 1930 physicists were wondering what they would do when all problems were solved.

> I may illustrate this light-hearted optimism by a recollection from my time in Zürich in 1930. I was then playing chess with another of Pauli's disciples who is now one of the most prominent physicists of my generation. We were not playing very seriously, for we were at the same time talking of a more exciting game: quantum-electrodynamics and all the difficulties attending to its formulation. I said: "It will give us work for many years to clear this mess." My companion protested: "No, not at all, it won't take more than a year. Perhaps it will take two more years to understand the nuclei and then physics will be finished. We shall have to go over to biology." Well, that was youth![10]

Is it reasonable to assume that one day scientists will have discovered all the natural laws and that the situation will then be such that there is no reason for continued study

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[9]P. S. Laplace, "Essai Philsophique sur les Probabilities," quoted in J. R. Newman, *The World of Mathematics* (New York: Simon and Schuster, 1956), 2:1325.

[10]L. Rosenfield, "Nuclear Physics, Past and Future," *Nuclear Structure Study with Neutrons,* M. Neve de Mevergnies, P. van Assche, and J. Vervier, eds. (Amsterdam: North Holland Publishing Co., 1966), p. 484.

of basic science? There are natural laws. Certainly for man the basic laws of the universe do not change. That is evident from the following revelation:

> And unto every kingdom is given a law; and unto every law there are certain bounds also and conditions. . . .
>
> And again, verily I say unto you, he [God] hath given a law unto all things, by which they move in their times and their seasons;
>
> And their courses are fixed, even the courses of the heavens and the earth, which comprehend the earth and all the planets.[11]

And in items of instruction given by Joseph Smith we read: "There is a law, irrevocably decreed in heaven before the foundations of this world, upon which all blessings are predicated—And when we obtain any blessing from God, it is by obedience to that law upon which it is predicated."[12]

Now it is conceivable that given a sufficient period of time man could discover a true natural law by scientific investigation. But how will he know whether his theory is true or not? It was pointed out in chapter one that simply because a theory appears to apply, this does not mean that it cannot eventually be replaced; hence pragmatism (the fact that the new discovery appears to work) will give no assurance of truth. Thus even if a scientist should discover a true principle at some remote time in the future, it is unlikely that this would lead to a dead end. Granted all efforts to find a more suitable explanation would prove fruitless, and the investigation might eventually be given up; but especially at the present state of science there need be little concern that the physical scientist will have soon discovered all the true natural laws and be left with nothing to do.

What Motivates the Modern Scientist?

1967 Nobel-prize-winning physicist, Richard Feynman, said with respect to why he does physics, "If anything was

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[11]D&C 88:38, 42-43.
[12]D&C 130:20-21.

more fun, I'd be doing it."[13] This probably reflects the attitude of most of those who study science and pursue scientific research. It has been said that the scientist remains dedicated to an experiment only so long as it doesn't work. When he fails he tries to analyze why, changes his approach, and repeats the experiment. This procedure continues until the project succeeds, at which time the researcher loses interest; he sometimes finds it difficult to maintain interest even long enough to prepare his results for publication; and then he begins to fail at some other project. No one likes to be a loser. No one will continue to fail time after time and still stick with what he is doing unless he has a good reason. Of course each individual has his own causes for what he does. Some are inevitably trapped in the field because that is where the money was while they were attending school. A few, of course, are doing research for the profit; however, profit is a much poorer incentive in science than in other fields. One's sense of wonderment at the order and harmony of the universe is strengthened by study, and it is a shame when a person becomes blinded by desire for profit to the extent that he cannot appreciate the wonders of what he is discovering. It is so easy for one to keep his eyes upon the ground and not to see the majestic mountains which surround him. We are so easily dragged into a routine and become eight o'clock to five o'clock machines who lose the ability to find joy in our tasks. Certainly the scientist is no exception. However, the man whose research is fascinating to him finds science very ego-satisfying. There are few things which can be compared with the thrill of finally solving a hard mathematical or physical problem after having worked at it for an extended period of time.

Everyone, the scientist included, who is in a position to choose to what goal he will dedicate his life should ask himself periodically the question, "How can I do the most good?" The Lord answered those who asked him that question in the early days of the Church: "And now, behold, I

[13]Hoyle, op. cit., pp. 148-149.

say unto you, that the thing which will be of the most worth unto you will be to declare repentance unto this people, that you may bring souls unto me, that you may rest with them in the kingdom of my Father."[14]

In spite of this instruction and because not all are called to be continuous full-time missionaries (although the admonition to "declare repentance unto this people" applies in a very literal sense to every member of the Church of Jesus Christ) there is a great deal of time to be filled with other activities, and there is the problem of sustaining life. Many feel that their time can be most valuable if they use the special talents which they have for understanding the logic and principles of scientific investigation. The most dedicated and contented scientists must feel (whether correctly and justifiably or not is a question which can be answered only for each specific case) that they are doing the most good by pursuing their work. Such a feeling is almost a necessity for the peace of mind and the dedication to carry on. Hence a feeling of worth, or usefulness, is an important motivation for scientific endeavor, as it should be for most other activities in which men engage.

The honest researcher, who realizes how little he really knows, has no trouble maintaining a certain humility about his accomplishments; however, a certain amount of pride comes from being able to say, "I know more about a given phenomenon than any other man," or, "The world is a slightly better place in which to live because of some discovery of mine." It is really only the person who knows little but who thinks he knows a lot whom it is difficult to convince that his proud balloon can be punctured at any instant by thorns which he has not yet encountered.

Science is a challenge. Men used to move into the western wilderness to have the opportunity to pit themselves against the unknown. The man who can push to the boundaries of knowledge and perhaps step over into new frontiers could be called a modern adventurer. The excitement of

[14]D&C 15:6, also D&C 15:1-6; 16:1-6; 81:1-4.

getting the world to reveal some of its secrets is just as great for the explorer of the atom as it was for the explorers of the new world.

Some men have a special talent for postulating theories and designing experiments to test their hypotheses. Being religious does not necessarily diminish or enhance this talent. In fact most of the great scientists of the past and of the present have been or are deeply religious men. It is a shame that often their religions have not been completely true. Some have been led astray in their science by false theologies. For example, Johann Kepler (1571-1630), although he made great contributions to astronomy and the mechanical theories of the solar system, spent a great part of his life trying to prove a harmony of the spheres, i.e., that planetary motions and distances were related to regular geometric figures and musical intervals. However, even this probably did not detract from his science. Had he not been religiously dedicated to the supposition that such harmonies exist, he may not have had the determination to pursue his investigations as he did. It does seem reasonable to suppose that there must have been a cause or causes for these great scientists to have been religious men. Could it be that some of them realized the futility of their own puny studies and the necessity of a divine intelligence to create the order in the world in which they lived? Could it be that having recognized and improved upon their abilities, their talents were added unto in accordance with the promises of the Lord, and they were given the talent of faith and religious conviction also?

Summary

This then is man's situation. He is placed upon the earth and by his own choice cut off from the presence of God. Man has a deep desire, longing, need for truth. Nietzsche asks, "What really is this 'Will to Truth' in us? . . . Why not untruth? And uncertainty? Even ignorance?"[15] There is no

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[15]F. Neitzsche, "Von den Vorurteilen der Philosophen," *Jenseits von Gut und Böse*, Erstes Hauptstuck, p. 1, (first published 1886).

logical reason why truth should be more comfortable, more sought after, than ignorance or error. Fortunately however, the "Will to Truth" has been planted in men from the beginning. The only way to discover truth with certainty is to rely on revelation from him who knows all truth. However, most men are unwilling or unable to discover truth in this manner, and a wise God does not reveal his knowledge to men before they can handle it, so they must rely on reason and experimentation, perhaps the next best thing to revelation. Those who have talent for such investigations are urged to improve upon it by their own drive for adventure and the need to satisfy their longing for the discovery of truth—their ego as it were. Man is compelled by his very intelligent being to investigate, to ". . . replenish the earth, and subdue it."[16]

[16]Genesis 1:28.

Chapter 3

OBJECTIVE: THE GOAL OF SCIENCE

Rational Insight

Which falls faster, a heavy stone or a pebble a hundred times lighter? Is it a surprise that Galileo pointed out in the seventeenth century that both fall at the same rate? Perhaps it would make more sense for the heavier object to fall faster. After all, the stone does hurt more when it strikes a toe. In the past it has sometimes taken hundreds of years to correct a misconception of Nature such as this one, illustrating how different the real world often is from what we would expect it to be. A hundred years ago Nietzsche expressed in the following words a certain disillusionment with man's attempt to understand:

> I'll be wise because I will
> And not for praise of strangers.
> I'll praise God because he made
> The world so dumb as possible.
> And if I choose to make my path
> As crooked as I can—
> The wise man began that way,
> The fool—finishes thus.[1]

[1]F. Nietzsche, *Entschluss*, translated from *Nietzsche's Werke* (Stuttgart: Deutscher Bücherbund, 1960), 1:250.

Cursorily examined, many things in Nature appear unbelievable or ridiculous, such as Galileo's stones or Copernicus' universe where the sun no longer orbits about the earth. However, simply because things are different from the way we feel they should be does not mean that God created the world "as dumb as possible." If he did not create the world according to a wise plan, he could not be our wise Heavenly Father, whom we worship.

A goal of the scientist is to gain rational insight into the way this world in which we live has been created. The scientist postulates, experiments, and postulates again until his ideas seem to fit together into some logical order. For example, at the beginning of the twentieth century our understanding of atomic phenomena was a mess. No one could satisfactorily explain the mass of data which had been gathered by chemists and physicists. A set of postulates by Niels Bohr, called by some the old quantum theory, began to make some sense of the data, and today it is felt that the atom is reasonably well understood. Now our concepts of what holds the atomic nucleus together are in the same mess, and undoubtedly, when the theories of the nucleus become satisfactory, there will be new problems and new theories to propose.

The Scientist's Creation

This world, which was created in the wisdom of God, may seem ridiculous to those who fail to understand God's wisdom. Nevertheless man wants to know. He has a drive to understand the world about him. He has to put some sense into Nature. Unfortunately that is almost exactly what happens. When one begins to study and generalize about his experiences, he puts sense into Nature. In a very real sense each man creates the world in which he lives. The person who thinks wholesome, clean thoughts and who has faith in his fellow men soon finds himself in a clean, wholesome environment because he has created that environment himself. Similarly, the scientist who has a reasonable theory

of the relationship between experiences often discovers that things seem the way he postulated them. Physical theories are simply a way of describing the interaction of man with Nature, not necessarily a description of reality itself. Each man's mental and physical environment is in very large part a result of his own prejudices about how things really should be. The scientist is no exception. He imposes his ways upon God's laws. To illustrate, consider the concept of the luminiferous ether popular during the nineteenth century. Light and other electromagnetic radiation were discovered to have wave properties. Since sound and other waves require a medium in which to propogate, such as air or water, the ether was postulated to be a tenuous substance of small density which filled all space and served as a medium for the transmission of light. The ether concept proved useful for years, although the many attempts to measure the speed of the earth through the ether always gave a result of zero. Finally, the efforts of Einstein "recreated" a concept of Nature in which the ether was no longer necessary.

It is usually difficult to tell just how much a theory actually fits the real world and how much it creates a world of its own. Certainly unless one is thoroughly familiar with a science, he often hears only of the successes of the theories and seldom of the data which don't quite seem to fit. Preconceptions are behind every new thought. Usually there is a point to make; and though one is not always aware of it, he imposes his own concepts on that which he studies. Even this book creates an environment to support a preconceived notion: That the gospel of Jesus Christ is true, and that truth is better discovered by revelation than by experiment and logic. Hence this volume, as all other investigations, cannot be completely objective.

Since all investigation, scientific or otherwise, is prejudiced by preconceptions, consider how fruitful it could be to first consider revealed truth and then to experiment and hypothesize, being first prejudiced by the truth. Certainly when this is possible one is more likely to be led to a true

picture of Nature than if he simply gropes for insight from darkness. The archaeology of the New World may be more meaningful to the archaeologist biased by the Book of Mormon than to others, for example; and why shouldn't the most successful astronomers be those who are prejudiced by revelations on the subject?

Description or Explanation?

Why do the planets orbit about the sun? Why does water freeze at thirty-two degrees Fahrenheit? Why does light travel approximately a million times faster than sound? None of these questions is appropriate to ask of a scientist. No scientist knows the answers. He is more likely to be able to answer the related questions: How can the motion of the planets about the sun be described? Does water always freeze at thirty-two degrees Fahrenheit? What are the differences between sound waves and light waves? There is a very distinct difference between the first three questions and the last three. The first ask *why*; that is, they require an ultimate cause. The latter questions ask only what can be discovered if one is observant and clever in the design of experiments. The why questions, if answered, would explain the world; the others only describe it.

Science does not explain Nature. That is the province of philosophy and theology. At best the scientist can only describe what he sees. When one pins him down as children often do by asking repeatedly, "Why?" he finally resorts to the explanation, "That's just the way things are," which is correct but not really very satisfying.

Predicting the Future

Almost invariably, when it is stated that the President of The Church of Jesus Christ of Latter-day Saints is a prophet of God, the investigator wants to know who the prophet is and what predictions of the future he has made lately. In this sense the choice of the word *prophet* is almost unfortunate. Certainly one of the functions of a prophet of

God is to predict the future, but that is not his major calling except when such predictions concern the spiritual welfare of men. Even the dictionary[2] states that the preferred meaning of *prophet* is "one who speaks for another, esp. for God. . . ." and only as a secondary definition is he "one who prophesies future events."

Uncertainty and ignorance are uncomfortable. The ability to predict the future holds a special fascination. In the past most religions have failed to satisfy man's desire to know, and the search for prophets in the familiar sense has turned elsewhere. Astrology, the supposed influence of star and planet positions upon human affairs, is an excellent example of man's early attempts to foresee his fate. The astrologer even enjoys some measure of popularity today. Experimentation and reason were viable alternatives for those whose religions and superstitions could not provide the insight they sought. Men turned to science for their predictions of the future. Laplace, in the eighteenth century, eloquently expressed men's hopes for science:

> We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for an instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it—an intelligence sufficiently vast to submit these data to analysis—it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes.[3]

Generally scientists are no longer as optimistic as was Laplace. In fact modern theories seem to exclude the possibility of any being, no matter how intelligent or vast, ever having access to sufficient data with which to predict the

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[2]*Webster's New Collegiate Dictionary* (Springfield, Mass.: G. & C. Merriam & Co., 1956).

[3]Pierre Simon Marquis de Laplace, *A Philosophical Essay on Probabilities*, translated from the Sixth French Edition by F. W. Truscott and F. L. Emory, New York, 1917, p. 4, quoted in J. R. Newman, *The World of Mathematics* (New York: Simon & Schuster, 1956), 2:1047.

future. But a researcher must still have some hope that he is helping to develop new theories which will in turn predict the results of future experiments. Some modern physical scientists seem to have become reconciled to an idea that further progress in science can only be made by filling in more numbers in larger tables and by buiiding larger computers to store, interpolate, and retrieve the data.[4] Such a prospect is indeed bleak, and one can only hope that they will some day be proven wrong by a new Isaac Newton or Albert Einstein. What a marvel it would be, for example, to have an effective mathematical model of the atomic nucleus with which one could predict with reasonable certainty the effects of interactions between nuclei.

This is also a goal of science, though denied by some, to predict the future at least in small pieces. In this respect we can perhaps better understand Dr. Hoyle's statement that physicists are the "priests of a not very popular religion."[5]

What is Not the Goal of Science?

In the past several pages, three commonly recognized goals of science have been considered. These are (1) to gain some rational insight into the physical world about us, (2) to describe what we see, and (3) to predict the results of interaction with the world. It is important that an explanation of Nature in terms of the ultimate cause of physical phenomena is not properly a goal of science. Neither is a proof of the existence of God a genuine scientific objective. Obviously one cannot look about him without having to marvel at the beauty and order he sees. Scientists throughout centuries have expressed their conviction of a creator or an organizer of that which they observe in awe.[6] Certainly this wondrous creation strengthens our faith in the Creator, but it is not a proof of his being. The proof lies in the word of God and personal testimony, not in materialistic philosophies.

[4]Otto Bluh, "Ernst Mach as Teacher and Thinker," *Physics Today*, Vol. 20, No. 6 (June 1967), p. 32.

[5]Fred Hoyle, *Physics Today*, Vol. 21, No. 4 (April 1968), pp. 148-149.

[6]See for example *Science and Your Faith in God* compiled by Paul R. Green (Salt Lake City: Bookcraft, Inc., 1958).

Chapter 4

OBJECTIVE: THE GOAL OF THEOLOGY

Different Goals for Different Theologies

As pointed out in chapter one, there are two kinds of theology, the revealed word of God and the philosophies of men. Just as the theories of science may not necessarily describe reality, so also one cannot rely on the theologies invented by men to be concepts of truth.

The goals of science, namely rational insight, description, and prediction, are contained within the goals of philosophy. However, the philosopher often steps beyond these goals into an attempt to explain the cause of his concepts and experiences. In the absence of revealed truth, philosophy has been a fascinating and valuable way of reconciling man's place in this existence and often of providing some hope for those who needed it.

It is amazing how closely some philosophers have approximated the truth without actually knowing it. (Perhaps it should be equally amazing how far from the truth men can stray in a short period of time without divine guidance.) Goethe, for example, speaks of a personal devil, a fallen angel, confronting a personal God in debate over the fate of Dr.

Faust's soul.[1] Fichte derived a concept of eternal progression as a result of his reluctance to believe that the purpose of life is only to bring children into the world who in turn have only that purpose.[2] Rousseau's government by the people[3] became part of the philosophy of a new country where the gospel could be restored. Nevertheless, men can only guess at what truth might be, unless it is revealed to them.

Revelation and Personal Guidance

One goal of theology, meaning the study of the revealed word of God and his creations, is to know the truth and to understand oneself and his circumstances. Philosophers for millenia have been concerned not only with the problem of the nature of reality, but also with the question, "Is there a reality outside of my own mind?" Because God has revealed something of his creations and plans to us, we are certain that there is a reality, and we know something about it. What a comfort it is to know that truth exists and that it will be revealed to us as we live worthy of that revelation and as we can handle that knowledge.

Why do the planets orbit about the sun? Why does water freeze at thirty-two degrees Fahrenheit? Why does light travel almost a million times faster than sound? To answer these questions is a goal of theology. The cause, the answer, to all these questions is the same: Because God in his wisdom saw this as the best possible way to create a world for his children. Imagine the consequences of water which froze at eighty degrees Fahrenheit or at minus thirty-two degrees Fahrenheit. Consider what would happen to the earth if it followed some random path through the universe. How different life would become if it took five seconds for light to travel a mile and over a year to reach the earth from

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[1]See "The Prologue in Heaven" in any edition of *Faust* by Johann Wolfgang von Goethe (1749-1832).

[2]Johann Gottlieb Fichte (1762-1814), *The Vocation of Man, Book III: Faith*, found in *The European Philosophers from Descartes to Nietzsche*, Monroe Beardsley, editor (New York: Modern Library, 1960), pp. 503 ff.

[3]Jean Jacques Rousseau (1712-1778), *The Social Contract*, found in Beardsley, *European Philosophers*, pp. 321 ff.

the sun. What would happen if you had to wait an hour after turning on the switch for the electric current to reach the light bulb?

A more important goal of theology is to answer the question, "What am I doing here?" The plan of salvation, of course, provides the answers—to gain a body[4] and to prove myself worthy of eternal life with God.[5] We know because it has been revealed that each intelligence is coeternal with our Father in heaven,[6] that intelligence was clothed in spirit by him,[7] and that man must also have a body of flesh in order to receive a fulness of joy.[8]

Of course in theology as in science one runs the risk of creating his own world if he fails to hearken to the guidance of God. One can see the influences of Greek philosophies in Christianity, and one can see the influences of the gospel in the philosophies of men. In some instances the developing churches have absorbed some points of pagan theology; in other cases some of the works of men contain truth because of the influence of inspiration. An illustration of the former situation is the Athanasian concept of the Trinity. This idea, developing about 300 A.D., is related to the following pattern of Greek thought: God is good; but what is good cannot be material, because material is evil. Therefore God is spirit, immaterial. There cannot be three separate immaterials; thus the Godhead is one immaterial good, three personages in one. The truth is that there are three separate personages in the Godhead, that God and Christ have bodies of flesh and bone, and that the Holy Ghost is a personage of spirit.[9] An illustration of a truth which crept into philosophy is the concept of enduring to the end, which is basic to Greek stoicism.

Even today and in recent modern times, men have misunderstood the truth and have created an unreal world about

[4]D&C 88:15.
[5]See Abraham 3.
[6]D&C 93:29.
[7]Hebrews 12:9.
[8]D&C 93:33.
[9]D&C 130:22.

them. In the early days of The Church of Jesus Christ of Latter-day Saints, as in other religions, men found themselves having visions and experiences which were not in accordance with the revealed plan of God. Since these experiences did not come from God, they must have been either of Satan or of men's own creation. They sincerely believed in a world in which those manifestations occurred, and their influence was halted only when the Lord instructed the Saints through the prophet that such revelations could not be of divine origin.[10] Although this may be frightening, it indicates that the human mind is capable of and responsible for much more than it is generally credited. The promise is that those who are faithful and endure will inherit eternal life.[11]

Predicting the Future

If a goal of science is to predict the future, theologians cannot ignore this task. There is a great distinction, however, between the prophets of science and the prophets of God. The most that a scientist can hope for, but not expect, is that he can predict the result of a physical experiment. The prophet of God can know all things pertaining to man's past, present and future existence, although the prophets have been commanded not to write some of the mysteries which God has shown them.[12]

Especially important for man to know is where he will go after this life and what is the most important thing for him to do while he is here. The plan of salvation teaches about the preexistence, when men lived with God and counseled with him.[13] The creation and purpose of the earth are described, as is also the "state of the soul between death and the resurrection . . ."[14] in the spirit world. Finally, of course, we are taught concerning the resurrected state and the degrees

[10]See for example D&C 28 and D&C 50:1-4.
[11]D&C 50:5 and 1 Nephi 3:7.
[12]See for example 1 Nephi 11-14, especially 14:25, and D&C 76, especially 76:114-119.
[13]See D&C 76, also Abraham 3, 4, and 5.
[14]Alma 40:11-14.

of glory which men will inherit depending upon how they live on the earth. Because the prophets have foretold this future state, men can plan their lives in accordance with the wisdom of God, prepare themselves to enter his presence, and help all their fellow men to experience the joys of eternal progression also.

Of course the prophets of God can predict events in the future of men in this life if so directed by God.[15] If it is wise to do so, the Lord may even allow the prophet to predict and describe the laws of Nature and the nature of men.[16] Just as important is the fact that each man is entitled to revelation and guidance in his own affairs.[17] Thus the scientist, the businessman, the teacher, the housewife, all men, are entitled to divine guidance if they live worthily.

Finally, the promise is made that all who live worthy will ultimately know the mysteries of the universe:

> Nevertheless, he that endureth in faith and doeth my will, the same shall overcome, and shall receive an inheritance upon the earth when the day of transfiguration shall come.[18]
>
> This earth, in its sanctified and immortal state, will be made like unto crystal and will be a Urim and Thummim to the inhabitants who dwell thereon, whereby all things pertaining to an inferior kingdom, or all kingdoms of a lower order, will be manifest to those who dwell on it; and this earth will be Christ's.
>
> Then the white stone mentioned in Revelation 2:17, will become a Urim and Thummim to each individual who receives one, whereby all things pertaining to a higher order of kingdoms will be made known;
>
> And a white stone is given to each of those who come into the celestial kingdom, whereon is a new name written, which no man knoweth save he that receiveth it. The new name is the key word.[19]

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[15]See for example the prophecy on war, D&C 87 and predictions of the discovery and development of America, 1 Nephi 13-14.
[16]For example, Abraham 3 and D&C 121:39.
[17]James 1:5-6.
[18]D&C 63:20.
[19]D&C 130:9-11.

Morality

The goals of theology are rational insight, description of the physical world, and prediction of future events. But more important than these are the goals of spiritual insight into the nature of man and the things of the spirit, description of the ways of God insofar as they are revealed to man, and prediction of the future estate of every individual based upon his understanding, acceptance, and obedience to the laws of God. Theology teaches man how to live. We prosper spiritually and temporally when we follow the counsels of God and his servants. Why? It is because the counsels of God are truth, God's laws, those concepts which allow us to relate to the universe in the best possible manner. When we live the truth, we bless ourselves. "There is a law, irrevocably decreed in heaven before the foundations of this world, upon which all blessings are predicated—And when we obtain any blessing from God it is by obedience to that law upon which it is predicated."[20] When we follow the counsels of men or our own ideas we are not necessarily following truth, we cannot relate as well to the real world, and we cannot expect the blessings promised by obedience to the will of God.

In short, theology is a study of morals, of how men should live. Science can only describe man's interaction with the world.

[20]D&C 130:20-21.

Chapter 5

OBJECTIVE: TECHNOLOGICAL PROGRESSION AND RELIGIOUS PROGRESSION

The Ultimate

There is a story of unknown origin which one hears periodically when computers are discussed. At some time in the future a group of scientists has built the ultimate computer. When the machine is finally completed and it is connected to power for the first time, the programmer chooses the most important question which could be asked and types it into the console keyboard, "IS THERE A GOD?" Everyone waits breathlessly while the computer grinds and blinks. Then the answer is displayed on the screen, "THERE IS NOW!" This story, aside from being funny or pathetic depending upon how it is interpreted, illustrates two things: man's desire to achieve and his questionable ability to handle what he creates.

Although most people probably feel that there is no point in putting the time, the effort, and the money into scientific research unless there is some hope of seeing technological results of that research, there are arguments in

favor of pure research as opposed to the directed efforts to develop a new product. Man has a great drive to know. He takes pride in being able to figure things out. For those who discount the spiritual aspects of man, this pride, this ability, is what differentiates man from the animals. Everyone should experience the exhilaration of solving a new problem or of gaining a glimmer of understanding of some facet of Nature. The data and theories of undirected research have often proved later to be invaluable in a description of some element of the universe. Consider, for example, the work of Lobachevsky and Riemann in non-Euclidean geometry during the nineteenth century. No project could have been considered less likely to have any application whatsoever to the real world. Yet this work gave Einstein the mathematics he needed for the theory of relativity, which in turn pointed the way for the nuclear reactor, the particle accelerator, and even nuclear medicine.

Nevertheless, the goal of scientific research is, directly or indirectly, progress in technology, meaning new products and new aids for man.

The second point of the story of the ultimate computer is that men may not be able to control the technological monsters which they produce. This concern is expressed more often now than ever before because of the problems which the world is beginning to encounter and which are blamed on technological progress. The computer which claims to be God is a rather remote possibility, but consider some of the more immediate problems, such as pollution of the earth, its air, and its water. An even more formidable problem is the balance of terror between nations due to the constant construction of larger and more destructive weapons and the deployment of more sophisticated missiles with which to deliver them.

Not all of man's problems in this respect are justly blamed on technology. A million automobiles, among the greatest causes of air pollution in the largest cities, for example, probably cause less pollution and other problems

than would an equal number of horses in the same area. It is man, not technology, which is at fault. How rapidly might our current problems be solved if the technologists could assume the task of their solution rather than the creation of megaton bombs! The answer to the situation does not lie in a slow death for technological progress; that could be disastrous. The only hope, rather, is the gospel of Jesus Christ. When men learn to love one another, to obey the commandments of God, and to seek his guidance, the people of the world can be engaged in the worthy cause of helping one another rather than scheming for destruction.

Technology and Humanity

Is progress in technology necessarily progress for man? Do men really live a better life now than in the nineteenth century or before when things seem to have been so much less complicated? The answers to these questions may not be the same for each individual. They depend on one's personal definition of progress.

Whether the new technology really means human progress is questionable when some of its products are considered. Conservationists are constantly fighting against the construction of new freeways, power plants, and coastal oil wells, all of which blight the landscape and eventually cause more pollution of the air or water. On the other hand, life would be much less comfortable without them. What if supplies of power were only half of that which is required or if one had to apply for permission to use overcrowded roads at least two days in advance? Factories and assembly lines dehumanize men; a man becomes an automaton performing a task repeatedly. However, how many of our grandparents by spending only forty hours or less a week doing the work on the farm could live as comfortably as we do? The television set is destroying children; they become passive learners and indifferent to violence; they cannot enjoy the company of their parents. But how much more of world events do the children of today know? How much less do they really communicate

with their parents than in the past? And how much closer are people to worldwide understanding? The above arguments point out only that progress in technology may require human guidance to really become the progress of men.

There are some contributions of the scientist and engineer which are generally recognized without argument to be beneficial to mankind. The person who is seriously injured or ill or who requires a tooth to be drilled is usually grateful for the progress made in the field of medicine and control of pain and disease. Social scientists are constantly learning more about languages and people; they help to improve relations between members of a family, neighbors, and nations. Washing machines, refrigerators, airplanes, snow plows, and automatic hot water heaters make life easier and safer for millions. Typewriters, printing presses, phonographs, and cameras allow men to make valuable use of the time saved by the washing machines, etc. Again, the human effects of technology depend on the humans who apply it.

Has Science Progressed?

For Aristotle in ancient Greece and the scientists of the Middle Ages who followed him, everything in the world was a combination of four elements: earth, water, air, and fire. That seems somewhat naive to modern man, who "knows" that all matter is composed of atoms. There are approximately one hundred known types of atoms. New unstable atoms are occasionally created artificially in accelerators. Atoms are made up of electrons, protons, neutrons, and perhaps some of more than one hundred other sub-atomic "elementary" particles. The electrons orbit the atom somewhat like the planets orbit the earth, except that they are held in orbit by electrical, not gravitational, attraction to the protons in the nucleus. No one really knows for sure what holds the protons and neutrons together in the nucleus or why the nucleus decides at a given instant in some cases to kick out some elementary particles to become a different atom. It all gets to be a very complicated theory. One cannot help

but feel that things were simpler for Aristotle. The irony of the situation is that now matter is divided by some scientists into four states—solid, liquid, gas, and plasma—reminding one of earth, water, air, and fire, so that one begins to wonder what the purpose of the intervening two thousand years of scientific progress has been.

In the early days of science it was simply assumed that all facts of a given phenomenon could be observed, and the man who could design the most ingenious ways to make an unknown aspect of Nature observable was the best scientist. In modern times theories are invented to describe unobservable phenomena, and it is expected that there are some facets of Nature which can never be observed. But this is being too hard on modern science. Certainly science has progressed. There are more data and there are more theories of the way man interacts with Nature today than have ever been collected before. All of these facts and theories are very useful in the prediction of what may happen under given, repeatable conditions. Unfortunately they may or may not have anything to do with reality.

Progress in Religion

The critical question in determining whether men have made progress in religion is, "Do we live better lives now than we would have lived in the past?" In the religious sense, a better life means closer communication with God and more ability or desire to carry out his wishes. I cannot properly compare directly how I live now with the way others lived in the past. I must compare how I live now with how I would have lived then. Each man is an individual, and religious progress for him is a change in him alone. There are times in the past when my religion may have actually been just as strong had I lived then as it is now. In the days of Enoch,[1] the prophet, the gospel was revealed and preached to the people. Any testimony of the gospel or any virtues which

[1]Moses 6 and 7.

I now have, I may well have experienced had I lived with Enoch.

The study of theology, however, does not necessarily improve a man's religion, nor does it even have to improve his theology. After Christ had been resurrected and the apostles were directing the Church under the guidance of the Holy Ghost, the gospel was preached to men for a time. However, as the apostles were killed or exiled, the Church began to decay and fall into apostasy. Theologians still studied theology, and there were still leaders of the Church; but the theology did not improve simply because men were studying it. In fact, quite the opposite occurred—the Church fell into more and more error. Pagan philosophy began to creep into its doctrine, and the teachings of Christ were changed. In time, one could buy his way out of sin, knowledge was suppressed, those who disagreed with the theology of the day became victims of the inquisition, and the superstitions of men abounded. Why did this happen? How can one study theology and make his religion worse? No doubt had I lived then, my religion would not have been as strong as it is today. In that sense one can say that religion has progressed since medieval times.

Religious progress is not proportional to the number of years between some arbitrary then and now. The cause of religious progress is divine guidance. Deterioration occurs in the absence of revelation, no matter how zealous men are in the study of theology. Of course, revelation alone does not make a man religious. Some of the worst problems in the early days of the Church of Jesus Christ in this dispensation were caused by men who had received revelations from God through the prophet and then turned against Him.[2] One must be willing to live in accordance with the theology revealed to him. Religion progresses when the truth is preached throughout the earth, when a prophet of God leads the

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[2]See for example the stories of John C. Bennett (D&C 124:16), William and Wilson Law (D&C 124:87-126), Robert D. Foster (D&C 124:115), and others in *Truth Restored* by Gordon B. Hinckley (Salt Lake City: Deseret News Press, 1969), pp. 78 ff.

Church of Jesus Christ, when men are enlightened with the love of their fellow men and of God, and when men have the peace of mind which results from living the gospel of Jesus Christ.

When is theology successful? It is successful when it is inspired, correct, and applied in the personal lives of the people who have a testimony of God's plan for them.

Chapter 6

RULES: POSTULATES AND ASSUMPTIONS OF SCIENCE

Implicit Rules

If men are to agree on what is meant by scientific investigation, there must be a set of rules which they commonly follow. Seldom during a scientist's formal education, however, is it explained to him exactly what it is that he is doing. Of course one learns about a number of the classic experiments and something about laboratory and research procedures, but the postulates and assumptions of science are only implied. If the student is fortunate enough to be directed to the philosophy department of his university or to study something about the history and philosophy of science, he is often surprised to discover that some people have seriously tried to learn exactly what science is.

When a person who has placed all his confidence in the exactness and reliability of his studies is impressed with the concept that the subject is neither exact nor reliable and that his colleagues often either do not care about or choose to ignore the uncertain relationship of their work to reality, disillusion is often the result. At some time in their lives most scientists find themselves face to face with the apparent

futility of their tasks. At that time those whose faith in God and themselves is weak may jump off the bridge or choose to join with those who ignore the problem and continue their work with no change in attitude. On the other hand many begin to wonder what really does make sense. Their faith and understanding are strengthened by their new perspective of themselves relative to God and the universe, and they begin to consider their tasks as a small part of an eternal plan.

Basically the assumption of the scientist is that "Nature can be understood."[1] Without this assumption, even among the ancient Greeks there would have been little impetus for the beginning or continuation of scientific endeavor.

Postulates

Four basic ideas are implicit in most scientific work: uniformity, causality, naturalism, and publicity. Many of the difficulties which a scientist encounters in his work arise from an attempt to satisfy these basic postulates. He may even choose to use a theory which he feels is not correct if it helps him to solve some of these problems.

Uniformity is a primary concern of most researchers. Experiments are expected to remain invariant not only in space but also in time. When Max Planck, for example, postulated in 1900 the addition of discrete energy quanta to the theories of discrete masses, it became difficult to reconcile the continuum theories of classical physics with this discreteness, and something had to be done to preserve uniformity. If discreteness were accepted as the ultimate property of space and time, drastic alterations in the theoretical description of Nature would have to be made. To solve the problem and maintain uniformity in the concepts of Nature a transformation was made via the Schroedinger differential wave equation from a description of matter in terms of position and velocity to a probability-related function, Ψ.[2] Ψ is then continuous in

[1]Louise B. Young, *Exploring the Universe* (New York: McGraw-Hill Book Co., 1963), p. 47.

[2]Ψ, pronounced psi, and the Schroedinger wave equation are described in texts on quantum mechanics. See for example Robert B. Leighton, *Principles of Modern Physics* (New York: McGraw-Hill Book Co., Inc., 1959), chapter 2 ff.

space and time, but even those primarily responsible for the transformation were aware that it does not adequately describe reality,[3] and though the uniformity of a continuous Nature is preserved, more difficulties are introduced.

With the introduction of probability, the problem of *causality* is encountered. Causality is sometimes called the principle of sufficient reason. Basically it means that every observable effect must have had an antecedent cause. Causality is a basic postulate of science because the effort of the scientist is to discover the cause—the situation immediately producing the current effect, not the ultimate, theological cause—of what he sees. If Nature exhibits a phenomenon, there must be a reason. When the physicist describes Nature in terms of a probability function, instead of by the position, velocity, energy, etc. of each physical system, he is in a sense expressing his ignorance of exact cause. However, this ignorance of cause is more serious than a simple void in available data. It is, in modern theory, an expression of the concept that one can never determine the exact cause of any phenomenon.

In order to avoid problems such as these, some scientists, rather than change their favorite theories, question whether the concept of causality is useful. They propose that causal laws may constantly change. Niels Bohr, for example, at one time is said to have suggested that the principle of sufficient reason may in some circumstances not be a workable concept.[4] Perhaps causality may not be necessary to scientific thought; however, it would be difficult to imagine the purpose of performing a series of experiments in any science unless a causal description were being sought.

The idea is often expressed that truth and reality change from time to time, that the "real world undergoes modifications along with the flux of experience."[5] This concept is

[3]E. Schroedinger, "Science and Humanism," *Physics in Our Time* (Cambridge, 1961), quoted in J. R. Newman, *The World of Mathematics* (New York: Simon and Schuster, 1956), 2:1056-1068.

[4]W. Heisenberg, "The Principles of Quantum Theory," in J. R. Newman, *The World of Mathematics*, 2:1051 ff.

[5]H. Margenau, *The Nature of Physical Reality* (New York: McGraw-Hill, 1950), p. 294.

often used to justify acceptance of theories today which were considered nonsense yesterday. It must be admitted that not everyone is satisfied with the same descriptions at the same time; but the scientist would be appalled if it were suggested to him that possibly on the basis of this fact he is led to accept an anthropomorphic reality, i.e., that Nature changes according to the will of the person experiencing it. The reason for the inability of different individuals at the same time or even for the same individual at different times to accept the same explanation is of course generally due to the knowledge and background of the persons involved. The scientist, especially the social scientist, openly proclaims this.

Naturalism, the rejection of all supernatural explanations, not only prohibits reality from changing as it wills but also leads to absurdities when one tries to assume that matter obeys different laws when divided into different sizes. For this reason most scientists are unwilling to accept any theory which holds for only one size (e.g., atoms or galaxies) or for one generation (e.g., for Newton or Einstein); they would rather try to extend or generalize a theory to provide for all experimental results, even at the expense of accepting ideas which they feel are not entirely correct. The general abhorrence of any suggestion of the supernatural in science is probably healthy for experimentation, but a supernatural explanation of an experimental result does not have to be the only alternative to the use of an incorrect theory if it is realized that the scientist's knowledge is limited, in fact nearly insignificant when compared with the knowledge of all things, and is not likely to be increased by ignoring the divine Source of knowledge.

Publicity in science is the idea that a true scientist has nothing to fear in making his views known to other scientists and in allowing them to repeat his experiments. This concept has the one obvious limitation of who decides what gets published and publicized. Without a doubt some theories throughout the history of science have been eclipsed by the more favored and well-established ideas of more popular

men,[6] even though in some cases the forgotten theories may have led to more satisfactory answers. On the other hand, much is published simply for the sake of publication, and there are undoubtedly some brilliant men who either do not have faith in their own work or disdain association with their colleagues and who do not make their ideas available for the criticism and use of others. It is important for a scientist to make sure he does not elevate a given theory to the position of a law of Nature because of the popularity of its author and at the expense of every possible alternative explanation.

Assumptions

There are a number of requirements which scientific theories are usually assumed to meet, although there may be no logical bases for these requirements. These assumptions are often called *a priori* principles. The most widely recognized is the idea of *simplicity*. Dr. Einstein stated that one is led to "search for those systems which are . . . the simplest ones possible." He noted that "a theory is the more impressive the greater the simplicity of its premises is, the more different kinds of things it relates, and the more extended is its area of applicability."[7] Thus he indicated his inclination, and that of others, to use a theory only until it could be replaced by a simpler one. One of the most common justifications given for any particular scientific theory is that it is simple (usually in principle more than in practice).

Nevertheless, one is inclined to view simplicity more likely as heuristic than *a priori*, i.e., practical rather than presumptive. One would not really expect the scientist to investigate a complicated theory before trying out a simple one. The same procedure would be expected in theology, art, music, or any other discipline as well; if there are both simple and complicated ideas on the same subject, the simple

[6]A case in point is Duane's (1923) explanation of wave-particle phenomena in terms of particles alone, mentioned by Alfred Lande, "Quantum Fact and Fiction," *American Journal of Physics*, 33:123 (Feb. 1965), but not even known in the modern literature.

[7]Paul Arthur Schilpp, ed., *Albert Einstein: Philosopher-Scientist* (New York: Harper and Row, 1959), 1:69 and 33.

ideas will most likely be tried first. The surprising thing is not that so many theories are so simple but that the simple theory so often seems to work at all. Many physicists share the opinion of Bertrand Russell: "I cannot help believing that some far simpler logical scheme of physics is possible than any yet evolved. . . ."[8]

Whether something works is a good test of its validity, but the *pragmatism* to which the scientist is led by the method of trial and error which he applies, if used alone, can also lead him to incorrect conclusions. An empirical equation, for example, can generally be developed to fit a particular set of data or a specific mathematical curve. The equation so developed can in fact provide a mathematical picture of the special case, but an empirical equation will never allow one to predict with any degree of confidence the results of similar but different experiments since the form and constants of the equation must be determined experimentally for each individual case. However, the scientist must often accept such a description because he does not have any which will work better.

One of the most important capabilities which a scientist should strive to develop is to know which question to ask. If he knows the limits of his knowledge and what he can do, he will likely not ask questions which he can answer only partly or not at all. When the questions he asks allow only half answers due to his limitations, if he is unaware that he is limited, he begins to believe that no better explanation is possible. In this case the inexperienced student of science sometimes begins to feel that science is impossible or too difficult. Then, based on this belief, he can only accept a reality which he can never measure or describe; he must then be satisfied with answers he feels to be incorrect but useful; he may even be inclined to accept a false reality or to reject the idea of a real world completely. Scientific research "being the slow advance of an earthbound party may lose itself in

[8]Bertrand Russell, *The Analysis of Matter* (New York: Dover, Inc., 1954), p. 332.

some pretty valley far removed from reality; or the searchers, after long and tiring pursuits, may come home and report that their presumed goal does not exist, that it is only a mirage, only visible from the upper atmosphere."[9] It should be emphasized that an earthbound, trial-and-error pragmatism does not have to be the only approach to reality, provided a person is willing to accept help from a Source who is not earthbound. Pragmatism is best accepted only as a desirable approach to a scientific theory and not as a basic, independent principle.

Every scientist expects to observe a *consistency* in his theories. This is not to be confused with uniformity. Consistency is concerned with mathematical formalism; uniformity requires a theory to be invariant in space and time. The mathematics of a theory is consistent if all elements of the theory can be expressed without the need to change from one set of mathematical rules to another or to make contradictory assumptions. If one set of data can be described by the theory, a similar set of data should be describable without altering the basic structure of the theory.

To rely on the principle of consistency is supposed to relieve the scientist of the need for exhaustive experiments to verify his hypothesis. After only a few experiments which support his theory, the physicist assumes, if it is consistent and Nature is uniform, that his theory is "true," even though his actual experiments are always statistically inadequate to support this assumption. This is a great timesaver, but consistency does not insure the truth of any theory. In light of the facts that the number system most commonly used seems to be based on a man's having ten fingers, that geometry until recently had been based upon postulates which are not all even necessary or complete for a consistent, useful system, that calculus was invented by physicists (Newton and Leibnitz) in an attempt to explain continuity, and that in other instances this mathematics which is required to be consistent seems to be based primarily upon historical accidents, it is

[9]Margenau, op. cit., p. 13.

perhaps surprising that a mathematical formulation of a theory is understandable and even amazing that the scientist finds it useful. This is not to degrade mathematics, which is the best logical system available; but it should point out clearly enough that the mathematical consistency of any theory is probably more a happy accident than an *a priori* principle. In any case this principle alone cannot justify any physical theory, although the scientist can most likely reject any idea which does not exhibit consistency and, in that respect, be a wise participant in the scientific game.

"A theory is the more impressive . . . the more different kinds of things it relates, and the more extended in its area of applicability."[10] Even the most brilliant scientists accept *generality* as a desirable quality for a theory. The correctness of a theory is often judged by the range of phenomena to which it can be successfully applied. It is perhaps the ultimate search of science to find a single theory which will account for all of Nature. Thus any theory which appears to hold for a wide range of phenomena, such as the theories of evolution or classical mechanics, is often sincerely claimed to be ultimate truth.

Common Sense Versus the Rules

The scientist generally holds tenaciously to common sense and the four basic postulates: uniformity, causality, naturalism, and publicity. The attempt to satisfy all simultaneously often causes him grief. He assumes that a correct theory must satisfy them all, but he seldom finds a theory which will do this; consequently, the scientist often feels obligated to ignore common sense and/or one or more of the basic postulates to satisfy the others. Thus he accepts and uses a theory or description which he feels is not quite correct, often eventually convincing himself that it is not really important to satisfy these requirements at all. He may even propose that a postulate does not always hold and that the rule should be rejected rather than the theory. Of course

[10]Schilpp, op. cit.

the scientist is free to ignore any postulate for a specific case and thus to avoid problems, but in doing so he is likely to find himself avoiding science as well. To realize how difficult it is to satisfy just a few basic principles is to become keenly aware of the necessity of obtaining help if one is to discover any truth at all.

Other assumptions could be added to the four principles —simplicity, pragmatism, consistency, and generality—which have been discussed. Every scientist has at least one ideal which he feels is necessary as the basis of any theory. These qualities are useful tools if wisely applied. The scientist, by their use, develops theories his colleagues can understand and use. However, a theory may satisfy none of the assumptions or all of them without changing its relationship to reality.

Chapter 7

RULES: POSTULATES AND ASSUMPTIONS OF THEOLOGY

Philosophy

There must necessarily be some difference as well as similarities between the postulates of theology, as represented by the philosophies of men, and the rules of science. Obviously naturalism cannot be a postulate of theology. However, if it is considered that even in the realm of the spirit eternal law prevails, a broader concept, which could be called *justice*, applies. One may relate this idea to naturalism (in science, the denial of all supernatural causes), in the sense that effects should not be explained by causes which violate the laws of God.

Justice is related to uniformity. The course of God "is one eternal round, the same today as yesterday, and forever."[1] God's plan does not change with time, and his plan encompasses all creation, all space, so that it is meaningless to ask if his plan changes with space. If God is just, his ways are uniform. The only apparent exceptions to the rule of uniformity with respect to this planet earth which the Lord created are the major changes it has experienced or will

[1]D&C 35:1 and D&C 20:12.

EFFECT / CAUSE	Temporal	Spiritual
Temporal	Science	Influence of the World upon Spiritual Growth
Spiritual	Aaronic Priesthood	Melchizedek Priesthood

Figure 3

Cause and Effect Relationships

experience, the spiritual and physical creations,[2] the fall from the paradisiacal state,[3] its baptism by water,[4] its baptism by fire and renewal to a terrestrial state,[5] and its death and resurrection to "its sanctified, immortal and eternal state."[6] Nevertheless even these drastic changes do not imply non-uniformity; they were all part of the plan from the beginning.

Causality can be extended to theology if the three cases excluded in science are not excluded from the study of God and his creations. The four possible cause and effect relationships are illustrated in Figure 3. The first causal relationship, that between temporal or physical causes and

[2]Moses 3:1-7.
[3]Moses 4:23-25; 5:1, 4 and Tenth Article of Faith.
[4]Genesis 7 and 8; 10:25.
[5]D&C 101:23-32.
[6]D&C 77:1-2; 130:9; 88:14-26.

temporal effects, is the causality of science. For example, the cause of ice is a sufficient lowering of the temperature of water. The other three relationships belong strictly to the study of theology. The spiritual effect of a temporal cause is illustrated by the situation of the man who gradually loses communication with God because he chooses to disregard the Word of Wisdom[7] or indulges in drugs or other physically harmful pursuits. The Aaronic Priesthood is to "hold the keys of the ministering of angels, and to administer in outward ordinances, the letter of the gospel. . . ."[8] This is the power given by God to administer to the temporal affairs of his children,[9] a spiritual cause of temporal effects. Finally a spiritual cause-spiritual effect relationship is exemplified in the power of the Melchizedek Priesthood to administer to man's spiritual needs.[10]

Some religious organizations encourage their members not to listen to the philosophies of other religions. It is almost as though they are afraid that their members will be influenced by some truth not taught from their own pulpits. Scientific theories are kept from becoming too radical by requiring that they be publicized. Should not *publicity* have the same effect upon theology? If one is convinced that his doctrine is truth, he should have no cause to fear the exposure of this truth to others, nor need he be concerned that the philosophies of others will change his truths to untruths. Publicity should not be shunned in theology, except in the situation where the things of God may be debased or ridiculed by men who are not searching for truth. One would not normally choose the corner bar on Saturday evening as the ideal surroundings for a religious sermon.[11]

Thus some of the basic postulates for theology have been discovered to be justice or uniformity, a broadened concept of causality, and publicity.

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[7]D&C 89.
[8]D&C 107:20.
[9]D&C 107:71; 20:46-60.
[10]D&C 107:8.
[11]Matthew 7:6.

Theories of God

The most important and most basic postulate of the study of God and his will has not yet been considered. This is the concept of God himself, his being, his nature, and his attitude towards men. There are four prevalent ideas of God which men employ in their studies. Without implying disrespect, three of these are sometimes called the theories of the divine watchmaker, the divine plumber, and the divine indifferent. The fourth is the LDS concept of God.

The divine watchmaker is the deity who creates a perfect universe, like a fine watch, winds it up, and lets it run. This is the concept of those who believe that God, although he is the Creator of all things, does not interfere with the world because everything is running smoothly according to plan. Inherent in this theory is the idea of predestination. When the universe was created, the future of all things, including every man, was exactly predetermined, and there is nothing that anyone can do to change or influence his own fate.

A completely different ideal for the nature of God is the divine plumber. Scriptures are often interpreted to support this concept of God. This is the God who steps in when needed in order to patch up problems which develop in his creation. To those who favor this theory, when the sun stood still,[12] when the earth was deluged and divided,[13] or when the language of men was confounded,[14] the divine plumber was the immediate cause. Contrast this attitude with that of the disciples of the divine watchmaker concept. The latter would argue that all these events were foreseen and provided in the beginning by the Creation.

The third concept of God is that which has probably been the most widely accepted in recent years, the divine indifferent. Basically, this concept is that God exists but that he is neither the Creator nor the immediate cause of the universe. In short, God is indifferent to the processes

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[12]Joshua 10:13.
[13]Genesis 7 and 8.
[14]Genesis 11:1-9.

of which he is part. This is the idea that God is existence itself. "The being of God is being—itself."[15] This is the philosophy of the existentialist, who attempts to find the meaning of life only in the state of being, of existing.

Goethe hints at the despair implicit in man's search for a meaningful concept of God when Dr. Faust, in his search for enlightenment, attempts to analyze the first words of the Gospel According to Saint John:

> "In the Beginning was the Word–" 'Tis writ.
> Here on the threshold I must pause, perforce,
> And who will help me onwards in my course?
> No, by no possibility is't fit
> I should the naked Word so highly rate.
> Some other way must I the words translate,
> If by the Spirit rightly I be taught.
> "In the Beginning was the Sense!" 'Tis writ.
> The first line ponder well. Is it
> The Sense, which is of each created thing
> The primal cause, and regulating spring?
> It should stand thus: "In the Beginning was
> The Force!" Yet even as I write, I pause.
> A something warns me, this will not content me.
> Lo! help is from the Spirit sent me!
> I see my way; with lightning speed
> The meaning flashes on my sight,
> And with assured conviction thus I write:
> "In the Beginning was the Deed!"[16]

The concept of God taught in the dispensation of the fulness of times by the prophets of God is basically summarized in one verse: "The Father has a body of flesh and bones as tangible as man's; the Son also; but the Holy Ghost has not a body of flesh and bones, but is a personage of Spirit. Were it not so, the Holy Ghost could not dwell in us."[17]

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[15]Paul Tillich, *Systematic Theology*, Vol. I (University of Chicago Press, 1951), Part II, Chapter II, Section B, pp. 235-252. See also Will Herberg, *Four Existentialist Theologians* (Garden City, New York: Doubleday and Company, Inc., 1958), p. 256.

[16]J. W. von Goethe, *The Tragedy of Faust*, translated by Sir Theodore Martin, edited by Nathan Haskell Dole (London: Robertson, Ashford and Bentley, 1902), p. 58.

[17]D&C 130:22.

We believe that God is literally the Father of the spirits of all men,[18] that he is a personage with whom we can communicate, and who loves his children only as a perfect Father could love. Christ is our elder brother, being the Firstborn of the spirit offspring of God.[19] ". . . He came into the world, even Jesus, to be crucified for the world, and to bear the sins of the world, and to sanctify the world, and to cleanse it from all unrighteousness; That through him all might be saved whom the Father had put into his power and made by him."[20] His misson on earth was to atone for Adam's sin and for the individual sins of the repentant so that virtually all men will be resurrected and that those who accept and live the testimony of Jesus Christ will inherit eternal glory.[21] The Holy Ghost has only a body of spirit; nevertheless, he is a personage. He is the Comforter, the Spirit of truth,[22] the Holy Spirit of Promise,[23] sent by the Lord to those who are earnestly seeking and living the truth.

The LDS concept of an anthropomorphic Godhead of three separate personages is considered naive by some theologians who have graduated to more sophisticated theories. They claim, for example, that "God cannot be understood as the existence of a being alongside others or above others. If God is a being, he is subject to the categories of finitude, especially to space and substance. . . . When applied to God, superlatives become diminutives. They place him on the level of other beings while elevating him above all of them."[24]

Certainly there are logical counterarguments to this view. There is no logical reason why God cannot be subject to space and substance, though these are limited concepts of men and will undoubtedly have new meanings when the eyes of each of our understandings are opened. The argument that superlatives become diminutives when applied to God

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[18]Hebrews 12:9; D&C 93:23.
[19]D&C 93:21.
[20]D&C 76:41-42.
[21]D&C 76:50-70.
[22]John 14:16-17.
[23]D&C 76:53.
[24]Tillich, op. cit.

again depends upon man's extremely narrow experience of the reality in which he lives. However, logical counterarguments only bring counter-counterarguments and do not improve one's concept of God. It is our faith and our personal testimony of him which gives us the comfort of understanding his true relationship to his children.

When one no longer has to choose between a creator who will not interfere and a God who constantly makes changes in his creation, the question of predestination is easily resolved. A personal Father in heaven, who cares about his spiritual offspring, will do those things which are best for them. The purposes of man's sojourn here on earth are to gain a body[25] and to prove himself worthy of living with God;[26] in short, to continue the process of eternal progression. God's plan for us was outlined from the beginning, and nothing can deter that plan. He knows his children and what we will do. Nevertheless, for our eternal progress it is necessary that we have the agency to choose for ourselves,[27] and he will not interfere with that agency. He directs his work on the earth and answers the prayers of those who call upon him in the wise manner of a father considering the requests of his sons and daughters, but he does not force anything upon us. Some are foreordained to particular tasks[28] in this life because Father knows them well, but no one is predestined. Every man must work out his own salvation by his deeds.[28] Then can the atonement of Christ have its effect.

Special Assumptions

One of the special assumptions which gives the Mormon theologian an advantage over some of his contemporaries is dependent upon the LDS concept of God. Because we believe in a personal Father in heaven with whom we can communicate through prayer, we know that truth exists and

[25]D&C 93:33.
[26]Abraham 3.
[27]D&C 58:26-29 and 3 Nephi 26:4-5.
[28]Third Article of Faith.

that there is One who knows all truth. "He comprehendeth all things . . ."[29] and he will reveal it to us when it is right to do so. "And if your eye be single to my glory, your whole bodies shall be filled with light, and there shall be no darkness in you; and that body which is filled with light comprehendeth all things."[30]

Creation is a continuing process; new worlds are organized, "as one earth shall pass away, and the heaven thereof even so shall another come; and there is no end to my works, neither to my words."[31] To comprehend all things pertaining to the present realms of existence does not mean that the creation of new worlds and new knowledge will cease. The work and glory of God is "to bring to pass the immortality and eternal life of man."[31] God's work will continue forever; his knowledge of his children has no end.

Another ideal upon which the gospel of Jesus Christ is based is that of *authority*. If one is to act for another, especially for God, he must first be given the authority to do so. "For behold, verily I say, that many there be who are under this condemnation, who use the name of the Lord, and use it in vain, having not authority."[32] Every priesthood ordinance, such as baptism or the laying on of hands to bestow the gift of the Holy Ghost, must be performed by those having the authority from God in order to be accepted by him.[33] That authority, when it is given, is the most powerful on earth. Eternal marriage and ordinances in behalf of those who are dead are included in its power.

> It may seem to some to be a very bold doctrine that we talk of—a power which records or binds on earth and binds in heaven. Nevertheless, in all ages of the world, whenever the Lord has given a dispensation of the priesthood to any man by actual revelation, or any set of men, this power has always been given. Hence, whatsoever those men did in authority, in the name of the Lord, and did it truly and faithfully, and kept

[29]D&C 88:41.
[30]D&C 88:67.
[31]Moses 1:38, 39.
[32]D&C 63:62.
[33]Acts 19:1-6.

> a proper and faithful record of the same, it became a law on earth and in heaven, and could not be annulled, according to the decrees of the great Jehovah. This is a faithful saying. Who can hear it?[34]

The revelations of God must obviously be *consistent.* There can be no contradictions in the laws of God. One can be certain that any doctrine which contradicts itself or which is not consistent with the scriptures contains some ideas which are less than truth.

The gospel is easily understood. The *simplicity* of the message of the restoration is one of the most impressive ideas to an investigator. The concepts of the Godhead and the plan of salvation are clear and precise. There is no doubt about our responsibility with respect to the principle of tithing and activity within the Church. Of course, there are mysteries to which God has not revealed the answers, and the discussion of these mysteries can appear very complicated. But such discussions are usually fruitless and are not necessary for us to fulfill our purposes on the earth.

Mormons are often accused of being *pragmatic.* That may even be considered a compliment. However, the will of the Lord is not accepted only because it works. The promise is given that "If any man will do his will, he shall know of the doctrine, whether it be of God. . . ."[35] and

> Even so every good tree bringeth forth good fruit; but a corrupt tree bringeth forth evil fruit.
>
> A good tree cannot bring forth evil fruit, neither can a corrupt tree bring forth good fruit.
>
> Every tree that bringeth not forth good fruit is hewn down, and cast into the fire.
>
> Wherefore by their fruits ye shall know them.[36]

This indicates that he who accepts the gospel and lives it will know by the rewards and the testimony gained that the gospel is true. The acceptance of truth brings blessings. We

[34]D&C 128:9.
[35]John 7:17.
[36]Matthew 7:17-20.

accept the Lord's plan for us and live it because we know it is true, not just because it works.

Finally, the gospel is *general.* The Church of Jesus Christ of Latter-day Saints is not an American religion. It is not a sect to which the Utah Mormons belong and which everyone else can ignore. The gospel of Jesus Christ applies to all men everywhere and throughout all time. The message of the Church of Jesus Christ is that God loves all his children and that a prophet of God directs his kingdom on earth now.

A Broader Concept

Some of the postulates and rules outlined in this chapter for the study of theology have the same name as some of those for the study of science. It should be noted, however, that in every case the rules of the gospel are broader and less restrictive than those of science. The concepts introduced in this chapter recognize the hand and will of God in the affairs of his children on the earth. In chapter one that study of Nature which considers the infinite and relies on revelation was called Science (capitalized). Thus the postulates of Science and the study of the nature of man and God are the postulates of theology introduced in this chapter. The rules of science are a very limited subset of the rules of Science.

Chapter 8

RULES: PROCESSES OF INVESTIGATION

Upon the Shoulders of Giants

"If I have seen farther, it is because I have stood on the shoulders of giants."[1] This is perhaps the best answer to the question of how the scientist acquires information and makes new discoveries. There is, of course, much more involved in scientific investigation than to extend the work of one's predecessors, but no man stands alone. Newton's discovery of the laws of mechanics and his development of differential calculus to explain these laws "involved his endowment with a degree of all the qualities essential to the scientific mind—pre-eminently the quality of mathematical imagination—that has probably never been equalled."[2] However, as with other men of genius in the history of science, he left no clear, logical statement of the method he used in his investigations; and it is necessary to search for clues in the works and writings of the greatest scientists to patch together a method which they might have used. It appears that the men who have achieved the greatest scientific break-

[1]Isaac Newton (1642-1727) quoted in E. A. Burtt, *The Metaphysical Foundations of Modern Science* (New York: Doubleday and Company, Inc., 1932), p. 207.

[2]Ibid.

throughs seldom had a clear feeling of what they were doing or how they were going about it; and the method of each differs from all the others.

There is, however, no great scientist whose biography I have read who has not built his great discoveries upon the works of those who preceded him. It would appear to be a clear-cut rule of investigation even in modern times that the scientist should have some understanding of the efforts of his predecessors. This does not mean only a familiarity with the publications in last month's journal but also to some extent a knowledge of the efforts and ideas of John Q. Unknown, who might have had a novel and unorthodox way of looking at things and whose concepts may lead to radical new insights. As the knowledge explosion continues and more research results are published by more scientists each year, the task of even being aware of what is happening in a very restricted field of endeavor becomes formidable. It seems almost hopeless that any man could assimilate sufficient information to develop a new concept unifying the theories of material science as did Newton and Einstein; and I fear that very few people still even dream of that goal.

"Scientific progress is made in two ways. One is the gradual reduction of the number of fundamental hypotheses needed to explain all the results of observation and experiment. . . . The other method of progress is the discovery of unexpected phenomena."[3] The Copernican picture of the solar system, with the sun at the center and the planets, including the earth, orbiting about the sun, is considered to have been scientific progress over the old Ptolemaic (approximately A.D. 150), earth-centered, epicycle theory. It took considerable time after the lifetime of Copernicus (1473-1543) for his theory to replace the older, satisfactory concept; just as it always requires some convincing for men to give up their old ideas for new ones. The reason that the heliocentric system of Copernicus was progress over the geocentric system

[3]M. A. Preston, *Physics of the Nucleus* (Reading, Mass.: Addison-Wesley, 1962), p. 3.

was that the former was simpler; fewer hypotheses were required. The Ptolemaic system was as successful at the time as was Copernicus in predicting the positions of the planets, the moon, and the stars; but an elaborate system of epicycles (circles centered on the circumference of larger circles) had been invented for this purpose. Copernicus did not need the epicycles.

News of Galileo's (1564-1642) discovery of four moons of Jupiter and spots on the sun[4] was certainly unexpected and was received with a wide range of reactions ranging from the enthusiasm of his friends to threats by his adversaries.[5] The unexpected discoveries were certainly scientific progress, but they destroyed the prevailing concept of the perfect universe and supported the Copernican picture. Galileo was eventually forced to recant his treatise of the system of the world and was forbidden ever to publish anything further.[6] Nevertheless, his discoveries were finally accepted, and science moved forward. Galileo expressed his frustration with those who prefer to sit and rationalize rather than to follow the evidence of their senses: "Hence they will philosophize better who give assent to propositions that depend upon manifest observations, than they who persist in opinions repugnant to the senses and supported only by probable reasons."[7]

The Senses and Experiment

It had been the habit until the fifteenth century to rely on logic and reason to build a concept of Nature. Before the time of Christ, philosophers had discovered that they could not rely upon their senses alone to give an accurate picture of the surrounding world. The image of the pages of this book which the eye perceives, for example, is a skewed quadrilateral unless the page is held squarely in front of the eye. Nevertheless, because of previous experience the mind transforms what the eye sees into a rectangular shape. A

[4]Stillman Drake, *Discoveries and Opinions of Galileo* (Garden City, New York: Doubleday and Co., Inc., 1957), pp. 50-57, 90-93.
[5]Ibid., pp. 73-74.
[6]Ibid., p. 281.
[7]Ibid., p. 118.

man is perceived to be as tall as a mountain if the man is sufficiently close to the observer and the mountain sufficiently distant. Usually the mind is not confused because it compensates for distances. An ice cube applied to the skin can feel like a scorching iron if that is what one is expecting. In many ways what the senses perceive is not what the mind conceives. Hence the reluctance to experiment and the impulse to reason.

Logic alone can be as misleading as experiment alone. By the early seventeenth century Galileo was experimenting in mechanics and observing the stars through the newly discovered telescope, and there were a number of the natural philosophers who were aware of the necessity for experimentation and reason together.

There may have been a time when one could simply sit and enjoy Nature, observing what was occurring about him and drawing conclusions therefrom. Voltaire is probably responsible for the story that Newton was led to the discovery of the laws of gravity by contemplating the fall of an apple from a tree.[8] This is the sort of discovery of which one dreams, but which seldom occurs. As the theories of science become more complex and as more people engage in scientific investigations, the means of making new discoveries also becomes more complex. In nuclear physics, for example, one cannot sit and observe. There may even be some doubt whether the nucleus as it is conceived exists at all. The most one can expect is to observe effects which can be attributed to the particles under scrutiny, not necessarily the particles themselves.

The most successful researcher in modern times is often the man who designs the cleverest experiment to entice new answers from Nature. How does one observe radioactive decay, for example? Marie and Pierre Curie painstakingly isolated radium and other radioactive substances and were able by the end of the nineteenth century to show off the glow

[8]Henry Smith Williams, *A History of Science* (New York: Harper and Brothers, Publishers, 1904), 2:237.

from such substances in the darkened laboratory.[9] By 1911 C. T. R. Wilson had invented the cloud chamber[10] (for which he received the Nobel prize in 1927), which allowed the atomic scientist to see the tracks of the charged particles emitted by decaying nuclei. Since then the devices with which to study the nucleus have become more and more sophisticated and, for the most part, more expensive to build and use.

It is not unusual now for tons of equipment, hundreds of thousands of dollars in electronics, a multimillion-dollar computer, and a large group of scientists, all to be combined in a special effort to measure one small effect. On the other hand there are still some who are clever at designing experiments to wrest secrets from Nature on a shoestring budget. Each scientist must decide for himself what equipment, funds, help and time he has with which to work; and then he must wisely choose a question to ask which he can answer with the means available. A physicist working alone with a small amount of radium ore, a geiger counter, and a stop watch, may still make an important contribution to science; but he needs to be ingenious to do so; and a little inspiration is invaluable.

Genius in science may well be the ability to see the unexpected and draw conclusions therefrom. Dr. Peierls points out that:

> When the mechanical and electromagnetic laws were clarified, it was thought by some people that the laws of physics were complete. It was a common tendency of text books, written about the beginning of this century, to present physics as essentially a closed subject, without any reference to unsolved problems. Of course, it was well known that the characteristics of the various substances could not be derived from any of the known laws, but this was not regarded as part of the task.[11]

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[9]Cleveland Moffett, "The Story of Radium," *Modern Inventions and Discoveries, New Science Library* (New York: J. A. Hill and Company, 1904), p. 88.

[10]Douglas McKie, "Charles Thompson Rees Wilson," *Encyclopaedia Britannica* (Chicago: Wm. Benton, Publisher, 1971), 23:471.

[11]R. E. Peierls, *The Laws of Nature,* (New York: Chas. Scribner and Sons, 1956), pp. 273-275.

When it was realized that physics had something to say about the hardness of diamonds, the electrical resistance of copper, or especially the characteristics of a black-body radiator, many surprises were in store. The quantum description of all these phenomena was the conclusion of the unexpected results, and after 1925 a few physicists were again asking themselves what they would do when all the questions had been answered by the new quantum theory. Not realizing that the theory raised at least as many new questions as it answered, some scientists again felt that physics was completed. "But it may well be that this final completion will always remain beyond our reach and that, however far our resources, our ingenuity and our curiosity can carry us along, every new piece of knowledge will reveal beyond it unsuspected new problems."[12] Isn't it interesting how closely this concept approaches the principle of eternal progression? Man is constantly learning, new problems are placed before him; and he answers them as best he can by experiment if not by inspiration.

Habits

Before the advent of quantum theory about 1920, the prevalent philosophy of science was that all natural phenomena are mechanical effects. In the extreme this is Laplace's concept that the future of the universe is determined by its present state and that its present condition is determined by the past.[13] This was a comfortable scientific philosophy, and it is hard to conceive of science being successful without this concept. One must believe that the phenomena he observes have a definite cause before he will wish to experiment to find that cause. Strictly speaking, this philosophy is difficult to reconcile with the free agency of men. Determinism implies predestination. However, as a scientist, the alternative to a mechanistic explanation of the universe is hard to accept.

In order to describe the atom and smaller entities, the philosophy of science has become in recent years one of

[12]Ibid.

[13]P. S. M. d. Laplace, *A Philosophical Essay on Probabilities* (New York, 1917), p. 4, quoted by J. R. Newman, *The World of Mathematics* (New York: Simon & Schuster, 1956), 2:1047.

probabilities. A direct consequence of the quantum theory is that some phenomena cannot be directly observed, not because of the limitations of scientific instruments, but because observation of the phenomenon changes its nature. The results of experiments based on these considerations can be predicted only statistically. It is impossible to predict exactly the position and velocity of any subatomic particle at any instant of time. It is possible only to specify the probability of its being at a given location. Note how unsatisfactory this limitation to probabilities must be to the natural philosopher. Ironically Dr. Einstein received a Nobel prize in 1921 for the discovery of the law of the photoelectric effect (when light shines on certain metals electric current flows). This law depends heavily upon quantum mechanics for the explanation of the nature of light required to produce a particular electric current. The explanation is ultimately dependent upon probability. In his later years Dr. Einstein very strongly opposed the new habit of considering descriptions of Nature probabilistically. In a letter to Max Born, written on November 7, 1944, he exclaims: "In our scientific expectation we have grown antipodes. You believe in God playing dice and I in perfect laws in the world of things existing as real objects, which I try to grasp in a wildly speculative way."[14]

When one's only claims are to be able to predict man's behavior, among other experiences, statistically or probably, the conflict with free agency is alleviated. Nevertheless, the concept is not comfortable. Also, one's belief that a conflict is no longer so serious does not necessarily imply that the new scientific philosophy is closer to truth than was the old one. It is hard to believe, as expressed figuratively by Einstein, that God throws dice to determine the fate of the universe. In fact his plan was outlined from the beginning, and its fulfillment is definitely not a matter of chance. In this instance it appears that the new philosophy creates as serious a problem when applied to the will of God as the

[14]Max Born, "Einstein's Statistical Theories," *Albert Einstein: Philosopher-Scientist*, P. A. Schilpp, editor (New York: Harper and Row, 1959), 1:176.

old determinism presented with respect to the free agency of man. How far from divine truth the theories of science must still be!

Another habit of scientific thought in the past has been the concept of an absolute. Before Copernicus the position of the earth as the center of the universe was the absolute. In the Copernican system the sun assumed this function. Newton's theory was dependent upon the universal gravitational constant; the attraction of every body to every other body was proportional to this number. For a time the luminiferous ether, postulated to fill all space, was the absolute reference system. The relativity theory of Einstein, as its name suggests, was supposed to do away with the need for an absolute frame of reference; but even here the break with tradition was not entirely complete because the speed of light, c, is the ultimate constant, the new frame of reference. Within recent years particles which travel faster than the speed of light have been postulated,[15] but even these particles, called tachyons, if real, could not travel slower than the speed of light; i.e., c is still an absolute. It appears that every theory, scientific or otherwise, must have a permanent frame of reference to which it can be related.

Training

It is generally assumed that the scientist must have a considerable number of years of formal education in order to contribute to the progress of science. This assumption is subject to argument, but that is another subject—the purpose and validity of education—and will not be discussed here. There is, however, another kind of training which is perhaps even more important to the processes of science than formal education. This is the training of experience. In a very real sense the way men observe things depends upon the experiences they have had. The human mind is extremely flexible; it believes what it has been taught to believe.

[15]"Are There Particles Faster than Light," *Scientific Research*, August 1967, pp. 34-35. See also an article by Gerald Feinberg in *Physical Review*, 159:5 (July 25, 1967).

Imagine, if possible, how a man would react to Nature if somehow he had been completely isolated from all experience with other humans from the instant of birth. Such an individual might well exhibit amazing powers, which can only be imagined. If the atomic theory is any approximation to reality, for example, all elements consist of much more space than matter. A crude picture of the atom is similar to a scaled-down version of the solar system. If this were true, might not the isolated man, who had never experienced otherwise, be able to walk through walls or see through solid objects? This example may seem extreme. A more believable but similar and familiar situation is learning to drive an automobile or to use a typewriter. A competely strange, uncomfortable experience, which requires every bit of concentration at first, soon becomes a habit about which the individual needs to make no conscious thought to perform.

A person who is ill and sleeps more than half the time may discover that it becomes difficult to distinguish between dreaming and waking experiences. What one sees in an experience with Nature depends on what he has seen before. The mind can be and is trained concerning what to expect and what to see. The dreamer usually discovers that he is dreaming when something occurs that he has been trained not to expect or when he awakens to a more familiar and logical world. If the situation of wakefulness and sleep are reversed, the person can become disoriented and confused. His usual world is now that of his dreams, and those experiences become more and more real. In short, men's minds are easily trapped by the situation in which they live.

For the scientist this training is extremely important in a negative sense. Unless the scientist can wrest his mind from the usual explanation and the usual observation, there is little hope of his making an important discovery. It is the man who can see the unusual in the phenomena observed and ignored by others and who can give a different interpretation to what he sees who is likely to make real progress in the description of reality. Perhaps this is one manner in

which God's ways differ from those of men. Men's normal experiences do not prepare them to understand the universe in the manner of our Father in heaven.

Science and Theology

Several processes of scientific investigation have been examined in this chapter, including building on the work of predecessors, reducing the number of suppositions required to describe phenomena, recognizing and using the unexpected, and utilizing a combination of experiment and logic. The dependence of scientific progress upon habits of thought such as determinism or probabilities and the concept of the absolute have also been considered; and the effects of training and experiences in one's life were mentioned. In the process of philosophic or theologic investigation one may not depend upon these same rules and habits.

Newton indicated that he stood on the shoulders of giants to perform his work. Certainly within the gospel of Jesus Christ there have been giants. We rely upon the scriptures and the prophets of God to teach the doctrines of Christ. Nevertheless, progress in the kingdom of God is also very dependent upon a personal testimony and personal faith. Missionaries are told that the way to serve the Lord is to study, work, and pray. Without work in the service of God and men, and without communication with Father in heaven, the study of the scriptures is not sufficient. It is not the work of our predecessors in the gospel which determines our eternal destiny; that is dependent upon our work, our prayers, and the atonement of Christ.[16]

The Saints are encouraged to live the gospel. This is their experiment, the test to determine that it is of God. "For behold, and lo, the Lord is God, and the Spirit beareth record, and the record is true, and the truth abideth forever . . ."[17] Habits of thought and in life are changed and overcome by the help of the Lord. A student of the gospel

[16]Third Article of Faith.
[17]D&C 1:39.

need not fear that his training within the Church will hinder his understanding. Men can understand more and more of the ways of God as they are willing to obey and to listen. The prophets speak for God. Each worthy man can receive the divine guidance which he requires for his sphere of responsibility.

Chapter 9

NATURAL LAWS AND MIRACLES

Two Definitions

The expression *natural law* has two definitions, which often give a double meaning to statements involving its use. At the level of scientific investigation, a natural law is simply a hypothesis concerning the relationships between experiences. The word *law* could well be replaced by *theory*. However, the theologian and even the scientist in some instances assigns a deeper meaning to this term when he is contemplating the universe about him. Then an ultimate guiding force is assumed to be at work and natural laws, or the laws of Nature, are the principles by which the universe is governed. In the first instance a natural law is only a supposition; in the latter case it becomes truth. Natural laws in the latter sense are the laws of God.

The word *miracle* also has two commonly used meanings. In the physical world a miracle is an effect which does not follow from the known natural laws, or theories. For example, to people living in 1873, Jules Verne's new novel, *From the Earth to the Moon*, was a far-fetched romance. Could they have foreseen that within a century men would actually travel to the moon and back, they would have called it a miracle, an event which transcended their wildest dreams. The second definition of *miracle* is a demonstration of the

power of God in an act which men cannot perform by their own power. These are the gifts of the Spirit which are wrought by the power of the priesthood in the name of Jesus Christ; namely, the gifts of healing the sick, of speaking in and interpreting tongues, of revelation, casting out devils, etc.[1] The first kind of miracles are those in which most men believe; the latter are performed by faith and righteousness and are not accepted by the world generally.[2]

The two definitions of *miracle* are directly related to the two meanings of *natural law*. The flight-to-the-moon miracle is an event which can be explained by natural theory at some time after the conception of the event. Healing the sick by the power of the priesthood can only be explained in terms of the laws of God. The distinction between the two is often not recognized, and men expend considerable effort in the attempt to reduce the gifts of the Spirit to the level of a trip to the moon.

Miracles Become Non-miracles

One of the implicit objectives of science is to explain away miracles. Men must have been saddened when Apollo ceased to drive the chariot of the sun across the sky[3] and was replaced by a description of the motions of the heavens in terms of natural laws. Two of children's favorite friends are Jack Frost, who brings the winter, and the Sandman, who brings sleep to weary eyes. How deprived are we adults who have replaced our trusted friends by the laws of physics and physiology. Descriptions of the world in terms of the supernatural are taboo in modern science, and of course this restriction allows men to perform their experiments without fear that they will reach a conclusion which they cannot explain.

Sometimes in the discussion of philosophy one must rule out reference to the scriptures. When the philosophies and

[1]D&C 35:8-9.
[2]Mosiah 8:18.
[3]Thomas Bullfinch, *Mythology* (New York: The Modern Library, 1941), pp. 36-42.

theories of men are being argued, nothing stops the discussion so cold as the statement, "But the scriptures say . . ." How can a group discuss and argue if everyone knows the truth? It is sometimes more fun to postulate, reason, and argue; and of course the Lord has not revealed his will on every matter, so that experiment and logic are an interesting if often fruitless method of attempting to understand reality.

This attempt to classify all miracles under some natural law has its dangers. How can one classify the works of God in terms of the theories of men? Men understand so little about God's laws that they often cannot even describe the most common experiences. Consider the question, "What is space?" This seems simple enough to answer, since all are so familiar with it; but one might as well ask of a fish, "What is water?" Where all motion is relative, might not the procedure of driving the car to grandmother's house be as well explained by transporting the car and grandmother's house to the same place or by moving the place to correspond with the car and the house? How would concepts of the world change if the concept of time were not based upon memory or vice versa? Time might then cease to flow in one straight path from past to future. What idea of time would men have if they could "remember" the future as well as the past? These ideas may seem odd or even ridiculous, but this sort of uncertainty, of questioning, occurs when men begin to contemplate even the most basic concepts of reality. Miracles are difficult to explain in terms of natural laws if those laws are only guesses.

So many things influence the individual's picture of his surroundings that he can only consider a small fraction of those things at a time. When the scientist attempts to describe Nature, he should always be aware that ". . . influences whose physical magnitude is too small to be taken account of by a finite being, may produce results of the greatest importance. . . ."[4] With this in mind he may safely try to apply his theories

[4]James Clerk-Maxwell, quoted in *The World of Mathematics*, J. R. Newman, ed. (New York: Simon and Schuster, 1956), p. 975.

to occurrences which have not been explained. He may discover truth, but he will be aware of the probability that he will not.

Trying Too Hard

In 1955 Dr. Werner Keller wrote a delightful book illustrating how scientists proved the historical truth of the Bible.[5] This book relates much of the history of the Bible, including events that were miracles of the times, and some of those miracles are "explained."

The story of the battle of Jericho is well known. At the command of the Lord, Joshua and his army marched around the walls of Jericho once each day for six days. On the seventh day they marched seven times around the city,

> And it came to pass, when the people heard the sound of the trumpet, and the people shouted with a great shout, that the wall fell down flat, so that the people went up into the city, every man straight before him, and they took the city.[6]

Dr. Keller relates:

> In the investigation of the ruins of the wall [of Jericho] Garstang [an archaeologist] noticed something quite interesting. The outer wall had fallen outward and the inner wall inward. There were also great gaps and holes in the wall.
>
> These observations led to the conclusion that an earthquake must have shaken the city. As geophysical maps show, Jericho lies in an earthquake zone which cuts across Asia over the Himalayas into Tibet.[7]

Consider the account of Moses and the children of Israel:

> And Moses stretched out his hand over the sea; and the Lord caused the sea to go back by a strong east wind all that night, and made the sea dry land, and the waters were divided.

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[5]Dr. Werner Keller, *Und Die Bibel Hat Doch Recht* (Düsseldorf: Econ-Verlag Gmbh., 1955).

[6]Joshua 6:20.

[7]Keller, op. cit., p. 157.

And the children of Israel went into the midst of the sea upon the dry ground: and the waters were a wall unto them on their right hand, and on their left.[8]

The scientific explanation:

In the early ages pilgrims assumed that the flight of Israel led through the Red Sea. They thought it was the north end of the gulf near the city "es-suwes," the Suez of today. Now and then strong northwest winds drive the water in the northern tip of the gulf of Suez back so far that one can wade through on foot.[9]

In one more miraculous account the scriptures relate:

And the Lord said unto Moses, Go on before the people, and take with thee of the elders of Israel; and thy rod, wherewith thou smotest the river, take in thine hand, and go.

Behold, I will stand before thee there upon the rock in Horeb; and thou shalt smite the rock, and there shall come water out of it, that the people may drink. And Moses did so in the sight of the elders of Israel.[10]

Listen to the modern description of the phenomenon:

Major C. S. Jarvis, who was British governor of the Sinai region in the thirties . . . writes: "The smiting of the rock at Raphidim by Moses and the coming forth of the water sounded like a true miracle, but this writer has actually seen it. A few members of the Sinai camel corps had stopped in a dry valley and began to dig in the coarse sand, which had collected at the foot of the cliff. They wanted to reach the water which slowly seeps through the limestone rocks. The men worked slowly, and Bash Shawish, the native Sergeant, said: 'Give it to me!' Wherewith he took the shovel away from one of the men and began to dig vigorously. . . . One of his hefty strokes struck the rock. The smooth, hard surface which always forms on weathered limestone broke and fell away. The soft stone underneath was exposed, and out of the pores came a large spout of water. . . . That is a very enlightening explanation of that which happened to Moses when he smote the rock at Raphidim."[11]

[8]Exodus 14:21-22.
[9]Keller, op. cit., p. 121.
[10]Exodus 17:5-6.
[11]Keller, op. cit., p. 132.

There are many more such explanations of miracles in Keller's book and in others. These descriptions are interesting and enlightening. They may even be related to what actually happened, but the direction of the Lord was necessary to make them happen when they were most needed. Scientists may eventually describe every miracle from the scriptures as the possible result of some scientific hypothesis. But will that have proved the scriptures to be true? It may not even be desirable to explain all the miracles away. Such an accomplishment certainly cannot strengthen a man's testimony of the Lord, nor can it encourage him to obey the commandments. What will have happened to the divinity of Christ if his every action is proved to have been only the work of a very wise man? Today it is popular, even for some theologians who are supposed to be leading their followers to God, to deny the place of Christ within the Godhead and to claim only that he was a great teacher, a moral philosopher. Could this be the result of man's attempt to invent his own theories for the explanation of the acts of God?

The concept that science can prove the truth of the scriptures and the existence of God is inverted from the truth. Science cannot teach men how to live. It cannot create a religion and a set of morals. Rather the gospel of Christ gives meaning to life. The gospel even provides a reason for studying science: to learn what one can about the creations of God. Scientific investigation does not prove the truth of anything. Rather the gospel gives some measure of how well the theories of science relate to reality.

Perhaps the greatest miracle of all is that there aren't more miracles. A wise Heavenly Father directed the creation of this earth and the heavens such that eternal laws are satisfied. Every miracle, even the gifts of the Spirit, are the result of the laws of God. The fact that everything works so well without constant divine intervention indicates how wise those laws are. If the balance of oxygen in the atmosphere, the distance of the earth from the sun, the great bodies of water, or any of the millions of other things ceased to follow the eternal laws, the results would be catastrophic.

Faith

Surely our Father in heaven has a sense of humor. His children come to the conclusion that nothing occurs in multiples of five in Nature; they can prove mathematically that five-sided crystals, for example, just won't fit together. Then they examine their hands, and they count the number of fingers on each and laugh and love him who helped to make it that way. We study the physics of flight and decide that aerodynamically the bumble bee is too heavy for his wings to lift him from the ground. Then one flies by, and we cry with joy that the Creation didn't depend on us. We must learn to have faith in God. We must learn that our endeavors to imitate his wisdom are valuable and interesting but very weak. We must learn to depend on him and seek his guidance in using whatever authority and power he has given us to perform miracles.

Chapter 10

LIMITATIONS OF SCIENCE

The Senses and the Spirit

When men limit the knowledge they accept to the relationships between temporal phenomena alone, they are severely restricting their picture of the universe. They are excluding all spiritual causes and all spiritual effects. The senses alone can only relate the experiences of the physical world to each other. Consequently the study of Nature, which is restricted to experiment and reason, rejects any influence of the Spirit. This is called the postulate of naturalism in science. Throughout centuries philosophers have argued about the relative merits of experience and logic, and the method of scientific research has swung from reason to experiment, thence to a combination of the two. A full measure of both is not sufficient for more than a very narrow picture of reality.

To discover truth, the Spirit is all-important. Scientific thought alone can give no proof of what is contained within the real world outside of one's own mind. Inductive arguments upon which science is based (e.g., every daffodil I have ever seen has been yellow; therefore, all daffodils are yellow), are never conclusive. Until I have seen every daffodil, there is no way I can prove my hypothesis that all daffodils are yellow. No number of experiments, no matter

how large, will prove a scientific hypothesis. It takes only one experiment, e.g., one white daffodil, to disprove the supposition. Hence no scientific theory can be shown to be truth. All theories are under constant scrutiny, and few if any have endured unchanged.

It has been said that perhaps science has less to say about reality than does poetry, considering that everyone reads Shakespeare but no one ever reads a two-hundred-year-old physics book. Perhaps this is because the physicist was expected to say something useful about the world, and it is slowly discovered that all his theories require change, and the old ones are no longer that valuable. The poet, on the other hand, is only expected to be wise or entertaining. Some bits of wisdom are spared the fate of becoming foolish in time and are allowed to endure. Science cannot pretend to provide a set of morals by which men should live. Poetry is allowed to preach and exhort, and thank goodness last year's morals are still somewhat more popular than last year's tables of data.

Method, Not Content

There is no body of knowledge which is called science. There is only a collection of data and theories which are the result of scientific investigation. Science is a method of learning, not a content of knowledge. The content of science is only the set of rules and assumptions previously discussed and the individual method of each investigator.

It would seem reasonable that there may be as many different ways of pursuing scientific research as there are individuals engaged in that pursuit. To a certain extent that is true; each man's method is different. However, all methods are limited in one way or another.

In the study of nuclear physics, one is impressed that all the experiments performed are essentially of the same nature, that of bombarding some substance with a collection of particles and watching to see what results. This seems a bit crude, and one is tempted to suggest that there must

be another way to examine the atomic nucleus. But when the challenge is issued to find a better experimental method the discovery is that not only is it difficult to conceive of any other workable experiment in this field, but that most of man's total experience is gained in the same manner, by scattering experiments.

To illustrate, consider the process involved in reading this book or in listening to music. In order to read the book there must be a source of light, part of which is aimed at this page; the black, printed characters on the page absorb most of the incident light, and the white paper reflects it. Where does the light go? It is scattered in all directions, but part of it is scattered into the eye. Less light is scattered from the print than from the paper so that the eye perceives the print as darker, and the brain takes over to analyze the results of the scattering experiment. Similarly, to hear music there must be a source, which may be a loudspeaker or a musical instrument. In either case the source sets up a vibration of the surrounding air. The air transmits the vibration from one molecule to another until part of it is scattered into the ear, vibrates against the ear drum, and again the anatomy of the ear and the brain take over to interpret the results. Here are two simple scientific experiences which are essentially bombardment-scattering experiments. There aren't many ways of observing Nature which do not utilize the same or a similar method.

Man's picture of the universe is then considerably restricted by the fact that there is virtually only one way, one type of experiment, with which to visualize it. It is like looking through a long, dark tube and seeing only what is directly opposite the other end. How much more there must be to the universe than what is at the end of that tube, if only the understanding could be opened and man could comprehend it! How glorious it must be to have one's eyes opened to the wonders of that which cannot be comprehended by experiment and reason![1]

[1]D&C 76:12, 114-116.

Another limitation of man's contact with reality will be enlightening to some. A. N. Whitehead[2] has suggested that matter may simply be a periodic form of energy, i.e., that periodicity alone is man's only contact with reality. Everything other than matter exhibits some sort of oscillatory or vibratory movement by which it is detected. For example, a musical note is nothing at an instant; the words *tide*, *day*, etc. require a repeating movement between opposites (high and low, daylight and darkness) to have meaning; light only exists as an oscillatory function of time. There has been some trouble reconciling concepts of matter with those of light and energy. If Whitehead's concept works, even matter would be analyzed as some periodic effect. Note how again this general idea of only one way in which to conceive of natural phenomena limits man's outlook on the universe to a very small peephole. This latter concept of everything observable being the result of periodic oscillations between opposite extremes reminds one somewhat of Lehi's sermon that there must be opposition in all things.[3] Perhaps the ideas are related.

Another limit to the scientific method is simply that of what can be observed. A theory may be logically perfect, and it may potentially predict many important results, but there may be no physical experiment with which to test it. In this case the theory must be rejected as meaningless. One possible illustration of this would be that the proton, a subatomic particle, is composed of even smaller, inseparable, charged particles. Such a theory might be used to predict the results of nuclear interactions, but the theory itself may be rejected because there is no way to observe the proton directly to verify or to disprove the hypothesis.

Uncertainty

One of the results of quantum theory is a so-called uncertainty principle. In the case of physics, this principle

[2]A. N. Whitehead, "Mathematics As An Element in the History of Thought," in J. R. Newman, *The World of Mathematics* (New York: Simon & Schuster, 1956), pp. 402-416.

[3]2 Nephi 2:11.

places a limit on the accuracy with which any phenomenon can be observed. However, there is another kind of uncertainty principle in science which is perhaps even more important than the theory with this name. That principle is the uncertainty of every theory as it relates to truth. Without divine inspiration, nothing is certain—not even man's own existence. Descartes (1596-1650) claimed that he could at least prove his own existence, "I think, therefore I am."[4] But Bishop George Berkeley (1684-1753) and David Hume (1711-1776) were able to show that there was no logical proof for the existence of either matter or mind.[5] Total uncertainty in philosophy and science was and is the rule.

The desire to know is strong, and not all men are willing to accept the verdict that they can never know the truth. He who has accepted the gospel can rely upon the revealed word of God and upon the personal inspiration which he receives for an assurance of truth. However, some men are left in despair. Goethe's *Faust* is the story of one man's desire for knowledge, which was so strong that he was willing to sell his soul to the devil in exchange for the knowledge that he might receive in return.

Unanswered Questions

What is electricity? How does light get to the earth from the sun? Does the atom really exist? What does it look like? Where is the edge of space? What was the origin of the universe? When did it all begin? All of these are questions which the scientist can answer only partially. He knows some of the properties of electricity, light, the atom, and space, but his theories of the nature of things are far from complete. His experiments can measure only the effects of these entities, not their nature. Consider the following hypothetical discussion:

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[4]Will Durant, *The Story of Philosophy* (Garden City, New York: Garden City Publishing Co., Inc., 1927), p. 166.
[5]Ibid., pp. 280-281.

Question: What is beyond the edge of the universe?

Answer: If one believes in relativity, space-time is curved, and the universe is closed. If one could see far enough, he could see the back of his own head; hence space, the universe, has no edge; and it is thus meaningless to ask what is beyond the edge.

Question: But I cannot conceive of nothing, that there is nothing out there.

Answer: Nothing is not out there. There isn't. There is a difference between nothing and non-being. Beyond the universe isn't.

These answers are good. They represent the current scientific hypotheses, but they are limited. They do not necessarily make sense. Man can only understand that part of Nature with which he is familiar. Beyond that, physics turns into metaphysics, and the unknown becomes incomprehensible.

Common logic has accustomed men to see only two alternatives in every situation. A statement is true or it is false, the answer to your question is either yes or no, either one scientific theory is true or its opposite is true. It is often not even considered that there may be other alternatives than the ones presently in mind. For many years there was a battle between advocates of the theory of evolution by natural selection and the theory of spontaneous generation of species. It was argued that only spontaneous generation could agree with the scriptures and therefore evolution was false. Now it is argued that only evolution can agree with observed phenomena and therefore the theory of spontaneous generation is false. Possibly both theories leave something to be desired. We don't give the Creator the option of being wiser than we are and of having any other alternative when we insist that one of these theories be false and the other true. The theories of men are limited by the experiences of men. God is not thus limited. "For my thoughts are not your

thoughts, neither are your ways my ways, saith the Lord. For as the heavens are higher than the earth, so are my ways higher than your ways and my thoughts than your thoughts."[6]

The limitations of science are to be found in the methods of investigation, the uncertainty of the truth of any hypothesis, and the questions which are necessarily left unanswered. In short, science is limited by the rejection of the influence of the Spirit. This does not imply that science is bad; only scientists, not science, can be subject to moral laws. However, the man whose only sources of information are sense-related experiences and reason misses most of the richest experiences of life.

[6]Isaiah 55:8-9.

Chapter 11

COMMON SENSE

Intuition

Common sense is the ability to build concepts from the experiences of the senses. It is related to good judgment. The concepts of reality thus formed allow one to relate to Nature with ease or difficulty depending upon how closely these ideas correspond to truth. More than this, however, the concept of common sense is related to intuition and conscience. Every man has been given a measure of the Spirit of Christ,[1] or the Light of Christ,[2] by which he can judge right from wrong. This judgment is called conscience, which, unless it is numbed by being ignored, will help men to recognize the will of the Lord. In turn, if the Light of Christ is heeded and one's capability to distinguish right from wrong is wisely used, "And if your eye be single to my glory, your whole bodies shall be filled with light, and there shall be no darkness in you; and that body which is filled with light comprehendeth all things."[3]

Men intuitively have some feeling for truth. They feel joy with truth and are uncomfortable with untruths. This

[1]Moroni 7:16.
[2]D&C 93:2.
[3]D&C 88:67.

is part of the message which the Lord conveyed to Oliver Cowdery upon the latter's inability to translate from the plates of the Book of Mormon:

> Behold, you have not understood; you have supposed that I would give it unto you, when you took no thought save it was to ask me.
>
> But, behold, I say unto you, that you must study it out in your mind; then you must ask me if it be right, and if it is right I will cause that your bosom shall burn within you; therefore, you shall feel that it is right.
>
> But if it be not right you shall have no such feelings, but you shall have a stupor of thought that shall cause you to forget the thing which is wrong; therefore, you cannot write that which is sacred save it be given you from me.[4]

Thus common sense is a gift of God. Men are aware of truth because of their very nature, that of intelligences coeternal with our Father in heaven,[5] and because of the personal inspiration and guidance given to each man. An abundance of common sense is a talent and a gift of the Spirit, just as an abundance of faith is a gift.[6] As with other talents, the man who is blessed with this gift is expected to improve upon it.[7]

Development of Science

It would seem likely, since common sense is a gift of God, that man's endeavors should show varying use of this gift. In science, for example, it would be expected that some new theories may arise from an attempt to reconcile common sense with the observations of Nature. An examination of some observations and scientific theories will show evidence of this procedure. Remember that theories of Nature do not just happen. They are created by men, who are influenced by the totality of their experiences. There will never be a scientific theory of reality which is not based upon the relationships of men to that reality.

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[4]D&C 9:7-9.
[5]D&C 93:29.
[6]Moroni 10:9-18.
[7]Matthew 25:14-30.

The quantum theory is one of the most striking examples of the development of a scientific theory to reconcile common sense with Nature. Concepts of an atomic structure of matter became popular with Leucippus and Democritus about 400 B.C., but until Dalton published a list of atomic weights in 1805, no degree of scientific rigor was associated with the concept of matter being divisible only to the size of discrete particles. Such phenomena as blackbody radiation and the photoelectric effect still defied description by the end of the nineteenth century because these effects depend strongly upon the interactions of individual particles and apparently cannot be described as continuous matter in continuous space, the common sense concept of extension. Planck discovered that the intensity of radiation can be described if it is assumed that energy can only be transferred in packets, or quanta, and Einstein used this hypothesis to describe the photoelectric effect. These successes were accompanied by Bohr's theory of the atom and the "old" quantum theory, but it required the efforts of E. Schroedinger and W. Heisenberg to give discreteness a mathematical formulation.

In the seventeenth century Newton had developed differential calculus, a logical extension of common sense continuity to the infinitesimal, in order to describe motion by three laws. In order to apply Newton's continuous differential equations of motion to discrete particle systems they would have to be reformulated as formidable difference equations, since the calculus concept of the infinitesimal limit does not hold for indivisible particles. Heisenberg discovered that the continuous differential form of the equation of mechanics could be preserved in this case by replacing the variables by matrices. Exactly why this substitution works is described in Heisenberg's own papers[8] and elsewhere.[9] The important concept is that expressing the atomicity only implicitly in the matrices allowed the problem to be handled in a familiar

[8]W. Heisenberg, *Zeitschrift für Physik*, 33:879 (1925).
[9]For example L. I. Schiff, *Quantum Mechanics* (New York: McGraw-Hill, 1955), pp. 122-149.

way, and simplicity and the sense of continuity did not have to be abandoned. E. Schroedinger[10] developed an alternative, but equivalent, method of preserving common sense continuity in the form of a wave equation for a function Ψ which is a "matter wave" replacing discrete "point" particles. The value of Ψ is related only to the probability of finding a given system in a given physical state.

Unfortunately the process of satisfying common sense concepts like those of Heisenberg and Schroedinger, by forcing experience to fit methods of mathematics and logic, often creates as many problems as it solves. A direct result of the quantum theory is the uncertainty principle,[11] which states that it is not possible to determine precisely both members of conjugate pairs of physical variables for any physical system at any instant of time. The most familiar conjugate variables are position-velocity, and time-energy. Thus by the uncertainty principle, for example, one can never determine exactly and simultaneously for any atomic particle where it is and how fast it is going. This ties in closely with Schroedinger's probability descriptions, which he did not believe to adequately "describe what nature really is."[12] Note the dissatisfaction and the uneasiness which arise from this sort of explanation. If these theories were a true description of reality, man's ability to know would be forever limited. Nevertheless, because quantum theory is in principle at least the most useful theory which scientists have today for describing atomic or smaller phenomena, it is heavily relied upon.

There are other scientific theories which have arisen from the attempt to reconcile common sense with observation. A philosophical problem which has plagued the scientist for centuries is that of action at a distance. For example, how can a magnet attract an iron nail a few inches away if there is no apparent connection between the iron and the

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[10]E. Schroedinger, *Annalen der Physik*, 79:361, 489, 734 (1926); 80:437 ff. (1926); 81:109 ff. (1926).

[11]Schiff, op. cit., p. 7.

[12]E. Schroedinger, "Science and Humanism," *Physics in Our Time* (Cambridge, 1961).

magnet? Why does the earth remain in orbit about the sun when there is only space between the two? To answer these questions the theories of magnetism and electricity were introduced in the first case and gravitation in the latter instance. However, these theories do not really satisfy. The statements, that there is a magnetic force field filling the space around the magnet which acts on the iron nail, or that all massive bodies are in the gravitational field of all other bodies, do not actually explain how the attraction occurs; they only provide a way of picturing the effects.

Einstein may have come closer to a reconciliation of common sense with action at a distance when he postulated that a body immersed in the space-time continuum causes a curvature in that continuum, and all other bodies are in effect attracted to the first body by virtue of that curvature.[13] Now this may seem very confusing and certainly not in accordance with common sense. Nevertheless, when analyzed carefully, this theory does preserve the familiar concepts of cause and effect and avoids the problem of forces propagated through emptiness by mysterious means.

Does Truth Change?

God's ways are eternal. His plan for his children on earth does not change, and men are expected to obey his commandments today as in the past or the future. Father in heaven gives special instructions to his children commensurate with the situation in which they live, but his commandments and the standards of perfection do not change. This is moral truth which is eternal with God.

What about natural laws? Do they change? At the level of being hypotheses of science the answer is, Yes, theories of Nature undergo constant revision and change. Natural laws, interpreted in the sense of the principles by

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[13]For a popular discussion of this subject see George Gamow, *Mr. Tompkins in Wonderland* or *Mr. Tompkins in Paperback* (Cambridge University Press, 1965), chapter 4.

which the universe is governed, are eternal; they do not change. How does one then explain the results of scientific investigation? Before 1932, for example, scientists were convinced that the atom consisted of two types of particles, protons and electrons. This theory of atomic structure worked well, but problems began to develop which led Chadwick to discover in 1932[14] that there must be another particle in the nucleus, namely the neutron. Thus the natural law, the theory, was changed. The atom was now constructed of three types of particles instead of two. Since then a large number of other "elementary particles" have been discovered,[15] and there is some uncertainty concerning their existence in the atomic nucleus. Does this mean that truth has changed in this respect? Did the neutron not exist before 1932? Of course, the answer is no. If the neutron exists now, it existed then. Perhaps the amount of truth which is known has increased, assuming that the later theory is closer to truth than the older ones. Men's ideas have changed; their world has broadened; but the truth has not changed.

Another type of related question, which is not so easily answered, is exemplified in the following: Does a falling tree make a sound if no one is in the forest to hear it?, or Could men fly before the invention of the first flying machine? Consider the last question first. In the case of the neutron, things were so simple—if it exists now, it must have existed then. What about the flight of men? If it exists now, did it exist then? No, you say, men could not fly before it was discovered that they could fly. It appears then that truth has changed. What is true today was not true a century ago. But wait. What is the difference between flying machines and neutrons? The answer lies in their relationship to man. That is what one must consider when these questions are asked. The flying machine has become a reality because it is an invention of man. The theory of the neutron, not

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[14]R. D. Evans, *The Atomic Nucleus* (New York: McGraw-Hill Book Co., 1955), pp. 426-430.

[15]R. B. Leighton, *Principles of Modern Physics* (New York: McGraw-Hill Book Co., 1959), chapter 20.

necessarily the neutron itself, has become real because it is an invention of man. The inventions of men change. However, the existence of a real physical entity, the neutron, and the potential of men to fly have not changed; both have always existed and will always exist. The truth, the universal laws, have not changed, nor will they change.

Does a falling tree make a sound if no one is in the forest to hear it? Is there a truth if no man comprehends it? The tree causes a disturbance of the air. That disturbance can be interpreted as that which produces sound. If there is an ear to hear, a sound is perceived. Truth is part of a universe which follows eternal law. The truth exists, just as the air disturbance in the forest. If there is an ear to comprehend it, the truth can be interpreted for man's own good. Truth is eternal; it does not depend upon man's ability to comprehend it. Men's theories of Nature are transitory. They depend upon the men who make and interpret them. "Science is a game in which we pretend that things are not what they seem in order that we may make sense out of them in terms of mental processes peculiar to us as human beings."[16]

Science is arbitrary; it can go any direction which the men who use it may decide. The scientist creates an understanding of experience by postulating a description of the world with which he can work mathematically to predict future experiences. This description must agree or be made to agree with his common sense picture of Nature; otherwise there is no satisfaction, and another description is sought. Common sense can be changed to agree with current scientific theories. Conscience can be altered to agree with current moral theories, "But if it be not right you shall have no such feelings, but you shall have a stupor of thought. . . ."[17] What an interesting concept that is!

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[16]R. Bruce Lindsay, "Arbitrariness in Physics," *Physics Today*, Vol. 20, No. 12 (Dec. 1967), p. 23.

[17]D&C 9:9.

Economy of Thought

"If we want to economize in thought, the best way would be to stop thinking entirely."[18] There are arguments that some day men can abandon the formulation of theories of science. With modern computers it may at some time in the future be possible to allow machines to perform the scientific experiments and store all the data in huge memory banks. When it is necessary to know how Nature will react under specified circumstances one need then only ask the computer, which will interpolate or extrapolate on the information it has stored, and the answer will be supplied. What an economy of thought that will be. Men can stop thinking entirely and become slaves of their own creation. What will stop this situation from occurring? Men have a gift from God called common sense. This talent, if magnified, requires that men question their place within the vastness of God's creations. It is this questioning, this desire for truth, which can prevent thought from becoming old-fashioned. Used in theology, common sense, or conscience, will direct us in our eternal progression. In science it will aid us to develop the technology and the concepts which allow us to ". . . replenish the earth, and subdue it. . . ."[19] Common sense is wisdom, and "Wisdom is the right application of knowledge."[20]

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[18]Max Born, *Natural Philosophy of Cause and Chance* (New York: Dover, 1958), p. 20.

[19]Genesis 1:28.

[20]David O. McKay, *The Improvement Era,* May 1968, p. 2.

Chapter 12

IS SCIENCE DOGMATIC?

Opinions or Facts?

The term *dogmatism* is usually associated with theologians and philosophers but seldom with scientists. It is the sectarian preacher whose picture comes to mind when the adjective *dogmatic* is applied, and perhaps this impression is deserved. There have been so many religions founded upon someone's differing interpretation of a scripture that it is not at all unusual to hear opinions preached from the pulpit as if they were facts. I once heard a mother remark about her son, who was the minister of a local church, "I sure wish my son didn't believe he was the only one going to heaven!" This exemplifies the attitude which has earned for some groups the permanent label of dogmatism.

Nephi was warned in a vision that the scriptures would be changed by the hand of men and

> Because of the many plain and precious things which have been taken out of the book, which were plain unto the understanding of the children of men, according to the plainness which is in the Lamb of God—because of these things which are taken away out of the gospel of the Lamb, an exceeding great many do stumble, yea, insomuch that Satan hath great power over them.[1]

[1] 1 Nephi 13:29.

Of course it is not only the current state of the world which matches Nephi's vision in this account. Western civilization passed through a long period of darkness following the death of the apostles and the loss of divine revelation. Philosophers were left to rely upon their own abilities and upon the authority of Aristotle and the others who preceded them. The doctrines of men became part of the philosophy of religion, and all who dared challenge that philosophy were in danger of being persecuted and labeled as heretic. As late as the seventeenth century the earth-centered universe with seven perfect spheres was such an integral part of the philosophy of the church that Galileo was forbidden to write about his discoveries concerning the planets and the heavens, and in 1642 the Grand Duke was forbidden to erect a monument in honor of Galileo if any word on it would "offend the reputation of the Holy Office."[2]

The opinions of men cannot long be preached as facts, whether religious doctrine or philosophical concepts. Sooner or later such opinions are subject to change, and then those who preached them will lose the faith of those who believed. In science the same applies. In Galileo's words, "In questions of science the authority of a thousand is not worth the humble reasoning of a single individual."[3]

Past, Present, and Future

In the history of scientific investigation nearly every account of a new discovery or a different theory of Nature is accompanied by some indication of the difficulties encountered before the old was rejected in favor of the new. Until the end of the eighteenth century, for example, it was supposed that the temperature of a physical substance was determined by the amount of phlogiston or caloric which it contained. A body with a higher temperature was thought to contain more phlogiston than a cold body. In 1798 an American, Benjamin Thompson, who later became Count

[2]S. Drake, *Discoveries and Opinions of Galileo* (Garden City, New York: Doubleday and Co., 1957), pp. 281, 287.

[3]J. R. Newman, *The World of Mathematics* (New York: 1956), p. 734.

Rumford of Bavaria, presented before the British Royal Society the results of an experiment which he had performed.[4] In the boring of cannons, which were kept full of water for cooling, it was discovered that the water boiled no matter how dull the cutting instruments were. This was interpreted as an indication that the friction of the process was the cause of the boiling temperature of the water rather than the release of phlogiston or any other substance from the metal into the water, and the concept of heat as a form of energy was born. Eventually this discovery contributed to the development of the principle of the conservation of energy, which surprisingly was a new concept as late as 1850.

Several young men arrived at "this great truth" at approximately the same time,[5] namely Julius Robert von Mayer, James Prescott Joule, Hermann von Helmholtz, and L. A. Colding. Joule was able to show that equal amounts of heat result from the conversion of equal amounts of mechanical energy, and Helmholtz expressed the idea that all forms of energy are equivalent. Nevertheless, at first these theories were not accepted, and in some cases the work of Joule and the others was completely ignored. Even today a remnant of the old phlogiston theory of heat remains in the language when one speaks of the transfer of heat as something, a substance, from a warm body to a colder one.

It is worth noting here the words used in describing the theory of conservation of energy in the textbook quoted above. That principle is spoken of as "this great truth."[6] Notice how subtle this influence is upon the way science is taught as truth, not theory. This textbook is one of the finest of its kind, and the authors are certainly not engaged in any devious plot to corrupt the minds of the nation's youth. Their presentation is one of the most understandable of any; yet, in this case at least, opinion is stated as fact, and the words become dogmatic, though subtly so.

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[4]R. Resnick and D. Halliday, *Physics* (New York: John Wiley and Sons, Inc., 1960), p. 466-467.

[5]Ibid., pp. 467-468.

[6]Ibid.

Another instance of a theory which was difficult to change in the history of science is that of the nature of light. A great debate raged for more than a century concerning whether Newton's (1704) corpuscular theory or Huygens' (1678) wave theory of light was the correct concept.[7] The discovery by James Clerk-Maxwell (1831-1879) that light can be described in terms of the set of consistent equations for electromagnetic phenomena, clinched the arguments in favor of Huygens' wave theory. But more recently it has been realized that science was somewhat hasty in expounding the dogma of a wave theory of light. With the advent of quantum mechanics in the twentieth century light must be assumed to have a wave nature to describe some experiments, such as the diffraction from a narrow slit; but it is required to have the properties of particles for other phenomena, such as the photoelectric effect. Dogmatism in the pursuit of science can only hinder its progress.

It would seem reasonable that the scientist would have learned to avoid proclaiming any theory to be absolute truth, considering the experiences of the past and the number of times that certainties have become uncertainties. The situation seems worse today, however, than at any time in the past. Perhaps this is only an apparent effect because the number of scientists is so much greater today than in the past, and a small percentage of dogmatists from a very large number of investigators is a large number.

Especially in modern physics, the so-called exact science, the opinion of the leading theorists has become accepted doctrine.

> Physics textbooks virtually decree that without the fiddling that experimentalists do with particles, the particles would have no properties at all, that the only mode of being is to be observed. All this prompts Freiburg University philosopher M. Bunge . . . to say: "For the first time in history, scientists have managed to outdogmatize philosophers."[8]

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[7]Ibid., pp. 890, 922-923, 927, 930.

[8]Robert Bernhard, "Skeleton in the Closet of Physics: Whatever Became of Reality," *Scientific Research*, Feb. 5, 1968, pp. 29-34.

Even aside from the uncertainties and the arguments of the modern theories, there is the question of the absolute in science which in this generation may be the speed of light or perhaps the temperature at which all molecular motion ceases. In past generations the absolute has been the position of the earth in the universe, the conservation law of matter and even the ether. All of these concepts were or are tenaciously held by some group of scientists; and the scriptures of science (the collection of data available), are always interpreted in favor of the most popular theory of the day.

I remember some years ago attending a public discussion at a large university between a geologist, a historian, a physicist, a theologian, and a chemist. The object of the discussion was a hypothesis by one of these men that the theory of evolution as it is generally accepted can be shown to be false. The material presented in the debate was to be factual, and no conclusion is drawn here concerning who was more nearly right; both groups had interesting arguments. Not long after the beginning of the program, however, each of these learned men, with only one exception, became so intent upon defending his own point of view that arguments based upon observation became impossible. The meeting became a session of name calling and threats. One individual was branded a crackpot and a paranoid, and another threatened the whole group with the danger of losing their eternal salvation if their opinions did not coincide with his. The situation probably would have come to blows had not the panel moderator closed the discussion and separated the disputants. The entire university became embroiled in the debate, and the controversy continued in the community newspaper for weeks. Of course the question was never resolved, nor is it likely to be until the Lord reveals the truth, which probably will be considerably different from the theories of any of the men present. Letters to the editor eventually became less vehement, each man went on believing that he was right, and the matter faded from the public eye. This is an extreme but not unusual occurrence within the

scientific world today as it has always been in the past. "The cold and aloof scientist is then a myth."[9]

What about the future? Is there any hope that the young men and women in school today will be more objective about the meaning of science than their counterparts in the past? Certainly this is what one hopes, and this is the goal to which this book is dedicated. However, it is difficult to see that the situation will improve when the textbooks and the teachers still teach the theories of men as if they were the truth of God. One of my best students, who is the son of a respected astrophysicist, and I were solving the problems of the world at dinner one day when the subject of flying saucers arose. He was asked by another student whether he believed that some of these phenomena might not be extraterrestrial vehicles; his immediate answer was, "No! My father says that is scientifically impossible." Perhaps he was correct, perhaps he was not. The point is that one cannot expect to discover the nature of the universe if he assumes on the basis of any popular hypothesis that some things are impossible. We need to be extremely careful not to teach the young people our own prejudices and guesses in the name of truth.

Scientists, Not Science

The discussion in this chapter has really centered on the attitudes of some scientists, not on that pursuit of knowledge called science. A method of investigation cannot be dogmatic. No procedure has a will of its own. However, those who apply the method may hinder their own effectiveness in that application because some preconception prevents an unbiased investigation. All men are biased. There is no way that condition can be escaped, and every man's reaction to Nature is based in part upon his prejudices. The ways to minimize the effects of bias in one's own life are first to recognize its presence and then to work to avoid being

[9]Israel Scheffler, *Science and Subjectivity* (New York: The Bobbs-Merrill Co., Inc., 1967), p. 2.

dogmatic about one's opinions. It is difficult for a man to change his mind on any subject in which he believes, but theories and technology are changing the world at a more rapid pace than ever before. Unless one can change with it he will be left far behind to live with his dreams, and he will find it increasingly difficult to relate to those about him.

It has always been a struggle for youth to reconcile their desire to independence with a need for protection. They are aware of the weaknesses in the accepted theories of men because these philosophies are rapidly changing. They will not accept the authority of those who persist in holding to useless and harmful prejudices. Note that philosophies and theories are the matter of discussion here, not the revealed truths of the gospel. It is not prejudice to hold tenaciously to divine light and wisdom. There is no danger in teaching youth the truths in the gospel of Jesus Christ. One can be dogmatic only about opinion and theory, not about truth.

"True science arises from investigating exceptional or unusual occurrences. As long as these are ignored, science remains dogmatic, set, the ideal of which is a closed and completed system of truth."[10] The answer to dogmatism is to remain alert to occurrences which appear out of the ordinary. If these occurrences are simply shrugged off as experimental accidents or are forced into existing theories, science has seen its end as an attempt to describe the real physical world. Scientific research cannot remain vibrant if the scientists rely only upon the authority and theories of their predecessors. "Science is the belief in the ignorance of the experts."[11]

No matter whether the subject is science or theology, dogmatism confuses. Confusion is not part of the gospel of Jesus Christ. The gospel is light and knowledge. Thus dogmatism is not an appropriate attitude for any member of the Church of Jesus Christ to embrace. Does this mean

[10]*The Philosophy of William James*, The Modern Library Edition (New York: Random House, 1925), p. 197.

[11]R. P. Feynman, "What Is Science?", *The Physics Teacher*, Vol. 7, No. 6 (Sept. 1969), pp. 313-320.

that the doctrines of his church will change? No, they are eternal. But there are philosophies of men, of which we must be aware, which are taught even by men within the true Church. The teacher should emphasize constantly the difference between the truths of the gospel which he teaches and his own opinions which he expounds. The student should be open-minded concerning what he is taught. He can have a testimony of the truth by prayer and obedience. Open-mindedness does not imply gullibility. Missionaries are constantly reminded that, "Ye are not sent forth to be taught, but to teach the children of men the things which I have put into your hands by the power of my Spirit; And ye are to be taught from on high."[12] Truth is always taught from on high. Theories are taught by men. We must believe the truth; we should be wary of philosophies; but most of all we can love those about us and help, not force, them to understand the joys of the gospel.

[12]D&C 43:15-16.

Chapter 13

CONFLICTS BETWEEN SCIENCE, THEOLOGY, AND COMMON SENSE

Naturalism

The major conflict between science and theology has been treated in chapters six and seven. This is the concept of naturalism, i.e., that no spiritual or supernatural causes or effects are considered in science. Naturalism limits what the scientist is capable of describing; and it often leads him to invent complicated answers to simple spiritual questions.

Sometimes people create their own conflicts between personal philosophies and the scriptures. A misunderstanding of the scriptures and a lack of understanding of a correct relationship between themselves and a scientific theory often drives people away from the gospel. A young man who was investigating the Church in Europe a few years ago had read the literature which the missionaries had left with him and was convinced, at least in his mind, that the message was true. During the interim between visits of the missionaries, however, he read in the newspaper the claim of a biologist that life would soon be created by man in a test tube. This destroyed his belief in the gospel. If man could create life, what then was the purpose of God? Here was a genuine

conflict which could not easily be resolved. Of course man has not created life in a test tube yet, and the anticipation of the event was premature. However, if God revealed the process and it were possible, nothing would change concerning the spiritual creation and the eternal nature of man. When men are worthy, God will reveal his secrets. This need not create a conflict if the difference between truth and theory is recognized.

There are a few people who have graduated from the Church. They consider that they know the gospel well enough; and, although they may still believe in some of the doctrines, they have a different idea of how they wish to live than is taught by the gospel. Their participation in Church activities is greatly curtailed because of the differences in philosophy. Again, a conflict has been created, which is based upon a misunderstanding, in this case a misunderstanding of the gospel.

> And there shall also be many which shall say: Eat, drink, and be merry; nevertheless, fear God—he will justify in committing a little sin; yea, lie a little, take the advantage of one because of his words, dig a pit for thy neighbor; there is no harm in this; and do all these things, for tomorrow we die; and if it so be that we are guilty, God will beat us with a few stripes, and at last we shall be saved in the kingdom of God. . . . they have all gone astray save it be a few, who are the humble followers of Christ; nevertheless, . . . they do err because they are taught by the precepts of men.
>
> O the wise, and the learned, and the rich, that are puffed up in the pride of their hearts, and all those who preach false doctrines, and all those who commit whoredoms, and pervert the right way of the Lord, wo, wo, wo be unto them, saith the Lord God Almighty, for they shall be thrust down to hell![1]

Real Conflicts

Not all of the conflicts which people create for themselves can be considered because of the individual nature of every man. Each person embraces a different set of thoughts.

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[1]2 Nephi 28:8, 14-15.

However, there are many very real conflicts between the truth and the descriptions of science, some of which should be discussed.

A set of these conflicts arises from the attempt of science to explain away the gifts of the Spirit. Consider the healing of the sick by the administration of the holy priesthood. There is no natural equivalent of this ordinance in science. Doctors of medicine theorize that healing is performed by physically repairing that part of the body which is abnormal. How that repair is made is a matter of disagreement between physicians, but unless the physician believes in the gospel of Christ his explanation of the healing ordinance is that either the illness was psychosomatic and was cured by suggestion or that the whole concept is some kind of trickery.

Casting out devils cannot be recognized by the scientist, since science rejects the concept of devils altogether. The presence of evil spirits is usually attributed to a psychological disorder and the casting of them out is the same process as healing the sick by psychological suggestion. Speaking in tongues and the interpretation of tongues are interpreted as special mental skill at learning languages. Revelation and prayer are superstitions by which men hypnotize themselves into a belief in supernatural communication. Faith is gullibility. The whole list of spiritual gifts could be considered, and the scientific explanations would be similar to those above. This does not mean that scientists reject God. A large percentage of scientists are deeply religious, perhaps because of the awe inspired by the mysteries of the universe. But scientific answers are not the same as the religious answers. In theology the health of the spirit is perhaps more important than the health of the body. In science the existence of the spirit is ignored.

Giving one-tenth of one's income to the Lord does not make sense from a rational point of view. Yet that is a commandment of the Lord, and he has promised blessings for obeying the commandment just as with the other commandments. "Bring ye all the tithes into the storehouse, that there

may be meat in mine house, and prove me now herewith, saith the Lord of hosts, if I will not open you the windows of heaven, and pour you out a blessing, that there shall not be room enough to receive it."[2]

Many stories are told concerning the law of tithing and how those who have given the tenth to the Lord have been blessed with physical possessions and monetary abundance or how they were spared some calamity. All of these stories are faith promoting and build testimonies, but tithing is also a spiritual law, and the blessings which the Lord promised are spiritual blessings also.

One of the most useful discoveries that can be made in science is a law of conservation. The conservation of matter and energy is perhaps the most fundamental principle of physics. To this one can add conservation of momentum, conservation of electric charge, and others. In the spiritual realm there are few laws of conservation. We always receive more than we give.

> I say unto you, my brethren, that if you should render all the thanks and praise which your whole soul has power to possess, to that God who has created you, and has kept and preserved you, and has caused that ye should rejoice, and has granted that ye should live in peace one with another—
>
> I say unto you that if ye should serve him who has created you from the beginning, and is preserving you from day to day, by lending you breath, that ye may live and move and do according to your own will, and even supporting you from one moment to another—I say, if ye should serve him with all your whole souls yet ye would be unprofitable servants.
>
> And behold, all that he requires of you is to keep his commandments; and he has promised you that if ye would keep his commandments ye should prosper in the land; and he never doth vary from that which he hath said; therefore, if ye do keep his commandments he doth bless you and prosper you.
>
> And now, in the first place, he hath created you, and granted unto you your lives, for which ye are indebted unto him.
>
> And secondly, he doth require that ye should do as he hath commanded you; for which if ye do, he doth immediately

[2]Malachi 3:10.

> bless you; and therefore he hath paid you. And ye are still indebted unto him, and are, and will be, forever and ever; therefore, of what have ye to boast?[3]

Prevalent Scientific Theories

In addition to the attitude of science towards spiritual gifts, there are other theories of science which are popular today and which at least appear to conflict with religious philosophy.

According to the theory of relativity, the speed of light is the ultimate velocity with which any finite body can travel. As this speed is approached, bodies become infinitely massive, time slows to a stop, and lengths disappear. By this theory a man traveling at the speed of light would find everything in the same place at the same time. This may be a partial description of processes within the universe, but the process of communication with God remains a mystery if no messages can be relayed at a speed greater than that of light. Considering that light takes approximately eight minutes to reach the earth from the sun and that light from the nearest star takes approximately three years to reach the earth, one might have to wait longer than he wishes for his prayers to be answered if the speed of light were the fastest his communication could travel. There is necessarily in the spiritual realm a law which conflicts with or at least transcends this physical theory.

A theory which most men have rationalized to have no conflict with theology is that of organic evolution. This is a very sensitive one to consider, because it has been discussed and tried so many times, and it appears to have stood the test of time. Evolution has crept into all elements of modern thought. Nearly every process is conceived as a continuing improvement. Everything gets better with time. The object here is not to pass judgment on the theory; it may or may not have some correspondence with truth. The attempt is only to point out that there are still unresolved conflicts

[3]Mosiah 2:20-24.

between interpretations of the theory and truth. The major problem from a theological point of view is not the question whether God might have chosen this method of creation. It is granted that the scriptures are vague concerning the physical processes involved. However, if the scriptures are accepted, death came to earth as a result of the fall of Adam. This is difficult to reconcile with a period of creation lasting billions of years and involving myriads of creatures. The argument may be avoided by restating the premise that there was no death from the beginning of the story until the Fall, but a number of new questions arise concerning what happened before the beginning of the story and why or how did Adam become the first man, etc. At the very least there are many unanswered problems in reconciling this scientific hypothesis with the revelations of God.

On a quite different level the concept of natural selection, that species grow in complexity by a process called survival of the fittest, collides head-on with a theory of physics, namely the second law of thermodynamics. The second law of thermodynamics states in essence that all isolated systems tend to a state of disorder. How then could an isolated earth, or a universe for that matter, satisfy both theories simultaneously? In a process of natural selection, according to physics, only lower, not higher, forms could evolve. Natural selection, if it existed, must have at least been directed by an outside power which could cause more organization as the result of change rather than less. But if natural selection was directed, then it was not "natural" selection, and the problems continue.

A more recent conflict of theories of science with theology is that of population growth. Large groups of people are using statistics to prove that there will be disaster on the earth if population growth is not drastically slowed. On the other hand, we are taught that there are spirits waiting to come to this earth to be clothed with mortal bodies, and that as many as possible should be blessed with LDS homes. The statistics are shown to be misleading, and another conflict

exists between science and religion. What is the answer? To limit population growth except for LDS families? Scarcely. Such a doctrine would limit the number of spirits who can come to earth. The answer is to trust and obey the instruction of the prophet of God and look forward to the time when science can be reconciled with the wisdom of God in this matter.

Science and Common Sense

Aside from the realm of theology there sometimes arise differences of opinion between scientists concerning which theories make sense and which do not. For example, for nearly two thousand years mathematics in general and geometry in particular had been based upon the postulates of Euclid. The system of logic thus developed seemed to be easily applied to scientific measurements, and everybody was happy. Almost everybody was happy, that is. There were a few mathematicians who questioned whether that fifth postulate, concerning parallel lines, was really necessary. Finally, in the nineteenth century Lobachevsky and Riemann succeeded in developing consistent geometries using a different set of postulates from Euclid,[4] and there now arose a question as to which of these systems of logic, if any, really corresponded to Nature.

Dr. Einstein then used these new concepts to develop the general relativity theory of curved space-time, and common sense appeared to be a thing of the past. The conflicts between science and sense were not in vain, however. Men were led to think about the nature of time and space, and it was discovered that perhaps conflicts had existed all along, they just hadn't been recognized. The senses, as opposed to common sense, have been mistrusted throughout history. Now accepted views of Nature were beginning to arouse suspicions also. The extent to which these speculations have been carried is poignantly illustrated in the following:

[4]D. E. Smith, *History of Mathematics* (New York: Dover Publications, Inc., 1958), pp. 335-338.

> We are so haunted by these ravaging and devouring aspects of Time that some recent writers, perhaps after seeing a film run backward, have told us how much happier we would feel if Time could be reversed. Then we should see thieves stealthily bringing presents of jewelry to strangers, millions of young men rising out of war graves, and Sunday editions of New York papers being magically transformed into green trees again.[5]

However, don't be fooled by the conflict between this hypothesis and common sense into believing that such a thing could never be believed. There is a scientific theory based upon this same concept. One explanation for the behavior of the positron, sometimes called an anti-electron, is that it can be described as an electron traveling backwards in time.[6]

The conflicts of waves and particles, determinism and probabilities, discreteness and continuity, which have been discussed earlier, are not new in our generation. There has always existed a conflict between science and sense in one form or another, and religions other than the truth have recognized a problem between theories which do not agree:

> It is hard for us today, with our nuclear preoccupations, to realize what passions the doctrine of atomism evoked long before the atom was discovered by the exact scientists. Atomism originally stood for iconoclasm, impiety, and atheism, because the Greek atomists conceived a universe under the reign of chance. Indeed most atomic thinkers through many centuries neglected the order, harmony, and beauty, the adaptation of structure to function, the ordered dance of the atoms, which mark many aspects of the world and for the religious are evidence of a divine design. If God is a principle of order, then atomic chaos, the disorder and random collisions of material particles, are the province of the Devil, and the atomic doctrine the most dangerous of all challenges to righteousness and wisdom.[7]

Here is illustrated what happens when one begins to assign religious significance to scientific theory. Again is empha-

[5]J. B. Priestley, *Man and Time* (London: Aldus Book, Ltd., 1964), p. 62.
[6]R. P. Feynman, *Quantum Electrodynamics* (New York: W. A. Benjamin, Inc., 1962), pp. 72-76.
[7]L. L. Whyte, *Essay on Atomism* (New York: Thomas Nelson & Sons, Ltd., 1961), p. 16.

sized the futility of any attempt to prove the existence of God or to discover moral laws from the theories of men.

The Search for Wisdom

Many more conflicts between science, theology, and common sense could be examined than those here. However, there is no virtue in dwelling on the negative attributes of anything. Rather, one is amazed that in so many cases everything seems to agree. In the case of the spiritual gifts as contrasted with the theories of science, the possibility of resolving the conflicts is small indeed. Spiritual phenomena can never be described by physical theories. Other conflicts of scientific theories with each other or with common sense are constantly being resolved by a change in theory. For the present at least science and theology remain completely separate fields of study except in those instances, such as the Word of Wisdom[8] where theology touches upon the physical world. One must not give up the search for truth in either discipline simply because they are different. Wisdom is being able to pursue both, placing each in its proper perspective.

[8] D&C 89.

Chapter 14

WHERE DOES SCIENCE LEAD?

Goals

The scientist's task is to create some organization in the data which he collects by observing Nature. His creation, a product of his own mind, may correspond to reality in some degree or it may not. In fact, some theories are postulated with full knowledge that they say nothing about reality, but they are useful in creating an image of Nature. For example, in descriptions of Nature it is usually necessary to simplify the picture as much as possible so that it can be understood. One way of simplifying the solution of a physical problem is to consider symmetries in space and time or in the properties of matter. In high-energy physics, "Theorists have found it profitable to consider approximate symmetries as well as exact symmetries. These approximate symmetries are not completely valid in Nature, but their physical predictions are moderately well satisfied."[1]

If a theory can predict results of future experiments, it is considered a useful tool of science. The theory need not be a true description of the real world for this to occur. Even the most basic principles of physical science, such as Newton's

[1]Roman Jackiw, "Introducing Scale Symmetry," *Physics Today*, Vol. 25, No. 1 (Jan. 1972), pp. 23 ff.

laws of motion, are used because of their effectiveness, not because of their truth. It is known that Newton's laws are only an approximate description of Nature at best. In the realm of very large velocities these laws do not predict experimental results; nevertheless, they do work in the everyday world, and they are simpler than the more sophisticated theories of relativity; so they are used in the knowledge that they only approximate the real world. In this case the scientist generally realizes that he is only approximating reality. Unfortunately, in most other cases the popular theories of science are accepted as absolute truth, and the investigator does not recognize the limitations of their application.

The goals of science then are to organize observations, describe Nature, and to attempt to predict the future. Are these goals really being satisfied by modern scientific endeavor?

Can Nature Be Understood?

There is some indication that modern concepts of the meaning and purpose of scientific investigation are not leading to philosophically satisfying results. In classical mechanics if a body is to move along a curve other than a straight line, an external force must be applied to the body to hold it on the curve. When the force is no longer applied the body moves in a straight line tangent to the curve at the point where the force was released, and soon the body is far distant from the location where it should have been. A familiar example of this result is what happens when an object is whirled about the head on a string and the string breaks. The object flies away in a straight line as soon as the force is released. Philosophically the same thing may happen to a concept as occurs to the object on the string. As long as men are aware of the goals to be achieved by the concept, it is forced to follow the path toward that goal; but as soon as the guiding force is released the idea proceeds on a tangent and eventually becomes a totally different concept heading for some goal different from that intended. If science, in

particular, is being allowed to drift without any concept of what it is supposed to accomplish, it may very well be hurtling off on a tangent in some arbitrary direction.

The original concept of science was that Nature can be understood. Theories and experiments were directed towards this goal. Copernicus was certainly working to simplify the concept of Nature with his postulate of a sun-centered universe; Galileo's investigations of motion and of the planets was experimental work designed to help man describe the world about him. Newton's laws of motion were perhaps the greatest single achievement in the history of man's attempt to understand his surroundings, and Maxwell's equations of electromagnetism unified the thoughts of many on that subject. Even Charles Darwin's *Origin of Species*, first published in 1859, was a bold attempt to describe Nature in an understandable manner; and Einstein's theory of relativity, though not widely understood, is an example of a theory designed to answer problems which could not be answered by older theories. All of these investigators had something in common, a belief that men could discover something about Nature, and the determination to try to satisfy the desire for knowledge.

Within the current century, however, many unusual and unsatisfying concepts have developed. The modern theories of science embrace the concepts of probability, uncertainty, chance, duality of Nature, and untestable hypotheses as fundamental postulates. The modern physicist is no longer allowed to believe that the current state of the universe is determined by its past. One can only define the probability of finding a physical system in a given state; and it is forever impossible, according to the theories, to measure some sets of physical variables. If an experiment cannot be performed to test a hypothesis, that theory is considered meaningless; and reality has no properties except those created for it by the experimental observations of the scientist. One is not surprised that some have given up the possibility of formulating new laws of Nature and have adopted a philosophy

that progress will come only by collecting more data and by building bigger and faster computers in which to store and retrieve experimental results.

What a long way the above concepts have deviated from the ideal of understanding Nature! It is time for the scientific community to reexamine the postulates and goals of science to determine if these goals are still important. If they are still valuable objectives, something must be done to preserve the optimism of the youth who are entering the field. Instruction in scientific method should include some introduction to the philosophy of science, and the thrill of scientific discovery should be relayed. If there are no dreams, there can be no progress. Youth must be allowed to dream of unifying and simplifying the results of observation as did the scientists in the past. To indoctrinate them that it is hopeless to discover new laws of Nature or understandable theories which work, is to doom the search for knowledge to the drudgery of accumulating trivia. Although the theories which relate closely to reality may be the most successful and the most satisfying, it is not critical to the progress of science whether a new theory is strictly true; this is a matter of morals and a concern of the spiritual man. For science to flourish it must be relevant. Does the new theory simplify the description of Nature? Will it enable men to think more clearly about the world around them? Is man encouraged thereby to dream of the future and what he can do for his fellow men? Does it help men to subdue the earth? The theories for which the answers to these questions is "Yes!" are those which will cause progress in man's understanding of Nature and thereby create a closer relationship with God, the Organizer of the universe and the Father of all men.

The opinion that science has outgrown men's ability to handle it is constantly becoming more popular for two reasons. One of these is the overwhelming mass of data and the question of whether it can ever be assimilated. The other reason is whether men are morally capable of controlling the powers which they have discovered. Consider the first ques-

tion of assimilating the data. The so-called knowledge explosion is increasing the amount of information at an almost incomprehensible rate. The number of living, working scientists is comparable to the total number of all those who have previously lived; and the emphasis is on publication of the results of one's research. One scientific journal alone, *The Physical Review*, is growing at such a pace that the mass of paper used would outweigh the earth within a few decades if nothing is done to change the trend. It is impractical for a scientist to attempt even to read all the available literature in his own field, much less to assimilate all the material produced. Can men handle this problem? Does this rapidly increasing mass of data preclude any scientist's ever developing a new unifying concept of Nature? The prospects look grim. Fortunately, however, one does not need to know everything in order to progress. This would be a logical paradox. There could not be progress without all knowledge, and one could not learn without progressing. The hope is that enough information can be collected by one man, or maybe even a group of men, that new, useful theories can be invented. It helps of course for one to have faith in the existence of truth and reliance upon guidance and inspiration from the Lord in any endeavor, including the formulation of scientific hypotheses.

The question of whether men are morally capable of handling their scientific progress is a more difficult one. The most obvious problems in this respect arise from the technological applications of the atomic and nuclear theories. It required the initiative of war to collect the funds and the people to study the processes of the release of nuclear energy. Then and now most of the research into this newest of all energy sources is directed toward the construction of bigger and more effective instruments of destruction. The number of nuclear weapons stockpiled around the world in this balance of terror is unbelievably large. The prospects of their ever being used are too horrible to imagine. The initial destruction would be only the beginning. Descendants of the

few survivors may be monstrously deformed for generations. This would be the ultimate fulfillment of Abinadi's prophecy: ". . . I the Lord thy God am a jealous God, visiting the iniquities of the fathers upon the children, unto the third and fourth generations of them that hate me. . . ."[2]

All of this is the result of the mistrust of men for one another. When will men learn to love? When will the law of the gospel be obeyed? Scientists have been awed, and some have been remorseful, that they had a part in developing the theories which led to these instruments of death and suffering. Yet the science is not at fault. This power could be used to help make a paradise of the earth if only men could trust and love one another. Consider the number of problems which could be solved if weapons production could cease and all those men could work on constructive projects rather than machines of doom.

Technology is blamed for the pollution of the air and water. Men seem to be using methods of science to make the world uninhabitable. Children die of hunger throughout the world. Poverty abounds in the cities of the richest nation in the world, while cities are burned and countries and people are senselessly destroyed. Cancer and other diseases continue to take their toll, and automobiles kill and maim tens of thousands of people every year. Yet these problems are not the result of science, and the answer to the problems is not to abandon the search for truth. Men and their unwillingness to follow the counsels of God create some of these conditions, and their foolish choice of priorities keeps them from finding solutions for the others. Pollution will not be cured by stopping technology, nor will cancer. The cures lie in the sincere efforts of sufficient men to lick the problem. Hunger is not eradicated by tearing down the research labs. People are fed by progress in the technology of the growth and distribution of food, by sufficient love of men for their neighbors.

All of this requires a shift of moral values from pride in possessions to a desire to live the gospel of Jesus Christ.

[2]Mosiah 13:13.

Whether science has outgrown man's ability to handle it depends upon man's attitude towards God and eternal law, not upon progress in science. Science is leading men neither to destruction nor to paradise. Men do that for themselves. Science is a tool which men use to reach whichever goal they desire.

Undemocratic Truth

How often one hears the statement, "Why, that must be true; everybody believes it!" Truth is not democratic. Neither are scientific theories. Virtually everybody believed in a flat, disk-shaped world for a long time; nearly everyone thought that men would never fly; practically nobody believed that men could ever sit in the parlor and watch what was happening on the other side of the world. Yet all of these notions are false. Surely there are concepts in which everyone believes today, which are also not true. A theory is not made truth simply because it is supported by the world's leading scientists and philosophers and because "everybody believes it." The doctrines of The Church of Jesus Christ of Latter-day Saints do not become false because only a fraction of the world's population believes in a living prophet of God. Truth is truth whether revealed by God or discovered by experiment. Theory remains theory, and no amount of belief will make it true if it is not.

In the gospel there is certainty and hope. In modern science there is much uncertainty and despair. In the celestial kingdom all truth will be revealed. How surprised those may be whose eyes are opened. Reality must be much different, much more glorious, than men can conceive with their limited senses on the earth. The gospel leads to truth. Science may lead to knowledge, but at present it appears to be leading practically nowhere. Men may be leading science to their own destruction. May God help us to change that course.

Chapter 15

THE RELIGIOUS FOUNDATION

Confusion

Confusion leads to despair, and dogmatism leads to confusion. Many opinions of men are preached in the name of science or religion; many of them conflict with each other; and many people will have nothing to do with organized religions because of some dogma which they were taught and which they can no longer believe. In spite of this there are not many individuals who are atheists, who believe in no supreme power at all. Nearly every man feels, if only ever so slightly, that there is a purpose for his life which is greater than his bare existence.

As a result of despair and disillusion men have turned from their superstitions and philosophies to the evidence of the senses and to reason in the search for knowledge. Reliance upon the senses is unsatisfactory because of the limited view they give of reality, but the senses at least allow men to relate to the real world and to each other with less difficulty than do superstitions. Like predicting the weather the evidence of the senses only allows men to gain a little insight into how Nature will probably react under a given set of circumstances. Without every bit of data no theory

of science can be certified as absolute truth, and it is temporally impossible to collect all the data. Those who believe in a God who plans and directs the universe know that there is a purpose and that the search for knowledge need not be a hopeless task.

The philosophies of men are equally as uncertain as the evidences of the senses. However, many philosophers and scientists have received a glimmer of truth and have boldly attempted to expand it. One learns a great many things about psychology, men, and the subtle influences of the Spirit if the works of poets and philosophers are read with the gospel in mind. To illustrate, consider the conflict between subjectivity and objectivity or the particular and the universal throughout the history of thought.[1] Each person sees himself as I, a subject, and as me, an object. I, a subject, is the universal, the center of the universe. If I cease to exist the universe might as well not exist. I am the all-important.

On the other hand me, an object, is the particular, a completely insignificant part of a vast universe. The loss of me would not cause the slightest perturbation. Hence one despairs of there being any purpose to existence except to the me, who is insignificant in the universe anyway. This despair, this conflict, is only solved by a God, who, although he created the whole universe, sees each individual as a subject, an all-important. He knows our every desire. It is frightening to consider how well he knows the sinful me; but he is a God of mercy, love, and understanding, and he also knows the tendencies I have for doing good. In the same way the only person outside of me, who sees me other than as an object, is one who loves me. To him I am all-important. Hence only God and love make the existence of me significant. The state of hell is to see oneself and one's past activities only objectively, to cease to love me. This entire discussion of "me" is all the product of various philosophers, none of whom belonged to the Church of Jesus Christ. But here

[1]See for example J. Maritain, "The Existent," in *Four Existentialist Theologians,* Will Herberg, ed. (Garden City, New York: Doubleday, Inc., 1958), pp. 37-54.

as in many other instances one sees the influence of the Spirit even in the philosophies of men. The conclusions at which this argument arrived hint at the truths of the gospel.

The Greatest Commandments

> Then one of them, which was a lawyer, asked him a question, tempting him, and saying,
>
> Master, which is the great commandment in the law?
>
> Jesus said unto him, Thou shalt love the Lord thy God with all thy heart, and with all thy soul, and with all thy mind.
>
> This is the first and great commandment.
>
> And the second is like unto it, Thou shalt love thy neighbor as thyself.
>
> On these two commandments hang all the law and the prophets.[2]

With only the scriptures upon which to rely this short sermon of Christ would give life purpose and meaning beyond anything which men can offer in their theories and philosophies. If men love God they have assurance of his being. They are willing to accept that there is an eternal plan for life on the earth and after death; and there is the satisfaction that somewhere, someone understands. The purpose of life is the second commandment, "Love thy neighbor as thyself." First, love thyself. Live your life as wisely as possible so that you can have confidence in and love for yourself. Then love thy neighbor. "Therefore all things whatsoever ye would that men should do to you, do ye even so to them. . . ."[3]

If in addition to the scriptures one accepts the word of the living prophets of God, even more insight is given into the purpose of life on earth. No amount of scientific research or philosophical reasoning could reveal to men the wisdom which God revealed to Abraham, for example, concerning the council in heaven at which all men were present and at which God's plan for our eternal progression was presented.[4] Lead-

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[2]Matthew 22:35-40.
[3]Matthew 7:12.
[4]Abraham 3:21-28; 4; 5.

ers were chosen, and their tasks were assigned. Some rebelled against the plan of God and were cast out. The earth was created as a place where man could prove himself and gain a body, so that his progression could continue. Commandments were given to help us live in accordance with eternal principles, and the atonement of the Savior was provided in order that we can return to God's presence by living his laws. Revelation is given constantly to direct God's work for us on the earth. What theory of men can say that much about man's purpose on the earth?

Science provides a foundation for technology. Without science there could be no progress in the material benefits which Nature yields to us. However, men can live without technology if necessary. Electric lights and refrigerators are pleasant, but candles and ice boxes served the same purpose. Life is more comfortable with the physical conveniences, but men were not less successful or less happy without them. Science is the foundation of a world view which can change without destroying mankind.

Religion provides a foundation for life. Without the gospel of Jesus Christ there is no progress in man's understanding of himself. He is left without a purpose in life, and the absence of religion may well destroy him. One can only regress spiritually without the influence of God. If one obeys eternal laws, the blessings follow. If eternal law is ignored, spirituality and meaning in life are soon lost.

Personal Testimony

No one is converted to the truth by the words of another person. Many investigators certainly believe what is related to them by the missionaries, and some are even converted to the missionaries; but conversion to the truth comes in only one manner, by the Spirit. The message of the gospel is that God lives; he is our personal Father in heaven. Christ atoned for our sins; and he is our mediator with God. The Holy Ghost is sent to those who are searching for the truth. And all men can return to the presence of God by obedience to

the laws and ordinances of the gospel. In the rest of what is taught are the details of how this all works and what it means to us. Conversion comes by following the admonition of Moroni:

> And when ye shall receive these things, I would exhort you that ye would ask God, the Eternal Father, in the name of Christ, if these things are not true; and if ye shall ask with a sincere heart, with real intent, having faith in Christ, he will manifest the truth of it unto you, by the power of the Holy Ghost.
>
> And by the power of the Holy Ghost ye may know the truth of all things.[5]

A testimony of the gospel of Jesus Christ and of his message to us concerning the meaning of life is a personal thing. No one can gain a testimony for me. I must work that out myself by studying the word of God and then asking him whether it be true. To those who ask in faith and in the name of Christ, it is promised that the Holy Ghost will give them a testimony. Men can believe in God, and faith in him can be a comfort and a foundation in their lives even without knowing the revealed truth. But how much more meaningful that foundation can be when one understands and has faith in the eternal principles of the gospel.

Eliza R. Snow summarized beautifully the purposes of life and the hopes which one learns from the gospel:[6]

O my Father, thou that dwellest
In the high and glorious place,
When shall I regain thy presence
And again behold thy face?
In thy holy habitation,
Did my spirit once reside?
In my first primeval childhood,
Was I nurtured near thy side?

For a wise and glorious purpose
Thou hast placed me here on earth,

[5]Moroni 10:4-5.

[6]Eliza R. Snow, "O My Father," *Hymns, Church of Jesus Christ of Latter-day Saints* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 1957), No. 138.

And withheld the recollection
Of my former friends and birth.
Yet oft-times a secret something
Whispered, "You're a stranger here;"
And I felt that I had wandered
From a more exalted sphere.

I had learned to call thee Father,
Through thy Spirit from on high,
But until the key of knowledge
Was restored, I knew not why.
In the heavens are parents single?
No; the thought makes reason stare!
Truth is reason, truth eternal
Tells me I've a mother there.

When I leave this frail existence,
When I lay this mortal by,
Father, Mother, may I meet you
In your royal courts on high?
Then at length, when I've completed
All you sent me forth to do,
With your mutual approbation
Let me come and dwell with you.

Chapter 16

"AND AS ALL HAVE NOT FAITH . . ."

Words of Wisdom

> And as all have not faith, seek ye diligently and teach one another words of wisdom; yea, seek ye out of the best books words of wisdom; seek learning, even by study and also by faith.[1]
>
> And set in order the churches, and study and learn, and become acquainted with all good books, and with languages, tongues, and people.[2]

Although the study by the senses and reasoning of the things of this world is much less effective in the discovery of truth than are faith and revelation, the commandment of the Lord to his servants in the latter days has been to seek learning in every worthy manner. Not every man has the faith of the brother of Jared, who "could not be kept from beholding within the veil."[3] Nor is it the wisdom of God to reveal all his mysteries to his children. Nevertheless, the commandment given to Adam was to subdue the earth, which can be done

[1]D&C 88:118.
[2]D&C 90:15.
[3]Ether 3:19.

only by learning of the earth. Hence men are commanded to study and to learn words of wisdom.

> Whatever principle of intelligence we attain unto in this life, it will rise with us in the resurrection.
>
> And if a person gains more knowledge and intelligence in this life through his diligence and obedience than another, he will have so much the advantage in the world to come.[4]

"It is impossible for a man to be saved in ignorance."[5] In order for men to fulfill their eternal destiny they must learn, especially of the ways of God, but also everything they can about their own existence. There are diversities of gifts given to men.

> For to one is given by the Spirit the word of wisdom; to another the word of knowledge by the same Spirit;
>
> To another faith by the same Spirit; to another the gifts of healing by the same Spirit. . . .
>
> And God hath set some in the church, first apostles, secondarily prophets, thirdly teachers, after that miracles, then gifts of healing, helps, governments, diversities of tongues.
>
> Are all apostles? are all prophets? are all teachers? are all workers of miracles?
>
> Have all the gifts of healing? do all speak with tongues? do all interpret?
>
> But covet earnestly the best gifts: and yet shew I unto you a more excellent way.[6]
>
> Neglect not the gift that is in thee. . . .[7]

Father in heaven has commanded all his children to use the gifts of talents which they have received. The ability to learn and to discover methods of learning is a gift of God. Men should not sit and wait for the Lord to reveal everything to them simply because it is difficult to discover truth by science.

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[4]D&C 130:18-19.
[5]D&C 131:6.
[6]1 Corinthians 12:8-9, 28-31.
[7]1 Timothy 4:14.

> Verily I say, men should be anxiously engaged in a good cause, and do many things of their own free will, and bring to pass much righteousness;
>
> For the power is in them, wherein they are agents unto themselves. And inasmuch as men do good they shall in nowise lose their reward.
>
> But he that doeth not anything until he is commanded, and receiveth a commandment with doubtful heart, and keepeth it with slothfulness, the same is damned.[8]

The endeavor to learn about Nature is a good cause. Those who are faithful to the commands of God may assist in the creation of worlds themselves. What better way is there to gain experience and humility than in the trial-and-error methods of scientific investigation? No scientist is on the brink of being able to create worlds, but he may be able to gain a small amount of understanding concerning this one.

The vocation of every individual within The Church of Jesus Christ of Latter-day Saints should be to serve the Lord. Most of us need an avocation, however, to make ends meet. The choice of the pursuit of science as that avocation need not be contrary to the will of the Lord if the attitude is one of curiosity, of humility, and not of dogmatism and pride. Science and theology do conflict, and there is no way to resolve that conflict as long as the spiritual influences in life are not measured in the test tube. However, there is no reason why a man cannot wear the cap of a naturalist in the laboratory, to make his hypotheses concerning the physical relationships in the world, and then exchange that cap for the crown of wisdom derived from spirituality and obedience to God in his personal life. It is the man who does not recognize the difference, who always wears only the naturalist cap, who has made science the god of his life. "No man can serve two masters: for either he will hate the one, and love the other; or else he will hold to the one, and despise the other. Ye cannot serve God and mammon."[9]

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[8]D&C 58:27-29.
[9]Matthew 6:24.

Men cannot afford to worship the theories of men, for they will soon begin to lose their faith in God. We must serve the Lord and use science only as a tool to improve our understanding and our lives so that we may serve him better. The LDS scientist should live worthily, so that he can recognize the promptings of the Spirit even when he is pursuing scientific research. The proper place for the naturalist cap, when in the laboratory, is underneath the crown of wisdom. Scientific endeavor must be subservient to the truths of God.

In the World of Men

When the problems encountered in the attempt to relate science to truth are considered, one wonders if there might not be a better alternative. A list of these alternatives which might be drawn from those available to men in their attempts to describe Nature by their own wisdom could be grim indeed. Superstition, chaos, ignorance, reason without experience, experiment without reason, even despair of being able to describe the world at all, would surely be included on the list. Philosophies, religions of men, and the decrees of kings have all been substitutes for the sciences at times throughout history. In every such instance understanding and even the physical capabilities of men have retrogressed. There has been no reasonable alternative to the methods of science, other than the revelations of God.

Everyone enjoys at least some of the comforts and time for activities other than the struggle to survive which technology has produced. If by some decree of government or some disaster of Nature all progress in science and technology should cease, the result would soon be chaos or worse. An attempt to halt all scientific research would mean a loss of most of the technology which is now enjoyed. Without new sources of energy there would soon be no power for refrigerators, nor would there be transportation for food with which to fill them. Without new methods of producing food,

millions would starve. Without medical research disease could destroy mankind. No matter how remote is the contribution of science to truth, it has become the foundation of physical necessity; and to suggest the abandonment of all scientific theories because of a questionable relationship to reality would be foolish indeed.

Knowledge is gained bit by bit and step by step. Only when it is revealed by God are we suddenly engulfed in a mountain of new truths. Even then it usually requires some time to understand the full meaning of that which was revealed. The dangers of having only a little knowledge have often been pointed out, but

> In the first place we may remark that the trite proverb that a little knowledge is a dangerous thing, absurd in other cases, is peculiarly so in this. This doctrine of fools would necessarily discountenance any education whatsoever because in passing from ignorance to the highest state of intellectual acquirement a man must be at one time induced with the dreaded little knowledge. The truth is that a little knowledge is a little good, and much knowledge is a great good, while ignorance is an unmitigated evil allying us with the beasts that perish.[10]

It is not a little knowledge which is dangerous. Men cannot afford to abandon science because only some theories or some discoveries yield a glimmer of truth. It is the attitude of men concerning what can or cannot be done with the little bit of knowledge which makes it dangerous. Men tend to believe that whatever they discover, no matter how insignificant, is of greatest importance. To realize the proper perspective of one's work is to prepare for presentation at a scientific meeting a report on a theory by which one expects to change the course of the world and to discover that only a few friends and the next speaker are interested enough to come to the lecture.

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[10]James Prescott Joule quoted by E. S. Barr, "James Prescott Joule and the Quiet Revolution," *The Physics Teacher*, Vol. 7, No. 4 (April 1969), pp. 199-208.

The Right Combination

"What is man, that thou art mindful of him? and the son of man, that thou visitest him? For thou hast made him a little lower than the angels, and hast crowned him with glory and honour, Thou madest him to have dominion over the works of thy hands; thou hast put all things under his feet. . . ."[11]

The animals do not reason or experiment. The angels dwell with God and bask in the light of eternal truth. Man is in between. Men are promised that in the resurrection they will know all truth and will become as the angels[12] if they keep the commandments of God. On the earth man can study, pray, and learn. This makes him better than the animals over which he has been given dominion.

Science is worth while. It cannot teach of the spiritual world, nor can it determine a set of morals by which men should live or prove the existence of God. We cannot even be certain that its theories will not have to change from day to day as men gain more experience and learn that older ideas were not true after all. Science is not bad, neither is it good. It is a process, a method. Only scientists have morals, not science itself. The actions of scientists may be good or bad, and the results of their work may make life on earth either paradise or hell, but the theories of science remain indifferent to the faith and morality of men.

Revelation is better than reliance on experiments and reason. But all things are not revealed, and men cannot sit and wait for God to do everything for them.

Science and theology in the proper perspective is the best combination of all. When divine guidance is accepted as the basis of life, and when the surety of truth is reserved for the revelations of God, then science assumes its proper role as the invention of men to aid in their search for the truth. No invention of man can be accepted as ultimate

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[11]Psalms 8:4-6.
[12]D&C 130:1-9.

truth unless it agrees specifically with the word of God. But theories are useful. They aid in describing Nature and in technological progression which ultimately allows more time for men to honor the priesthood, to help their fellow men, and to work for the building up of the kingdom of God on the earth in anticipation of that time when they can know all truth.

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SCIENCE, SAINTS, AND SENSE

by

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A scientist and educator, Ken Walter is an active member of The Church of Jesus Christ of Latter-day Saints, which he joined in 1955 as a young man in Cheyenne, Wyoming. He has served a full-time mission in Germany and has filled a number of Church positions as teacher, clerk, and administrator. He currently teaches Sunday School in the Claremont (California) Ward.

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